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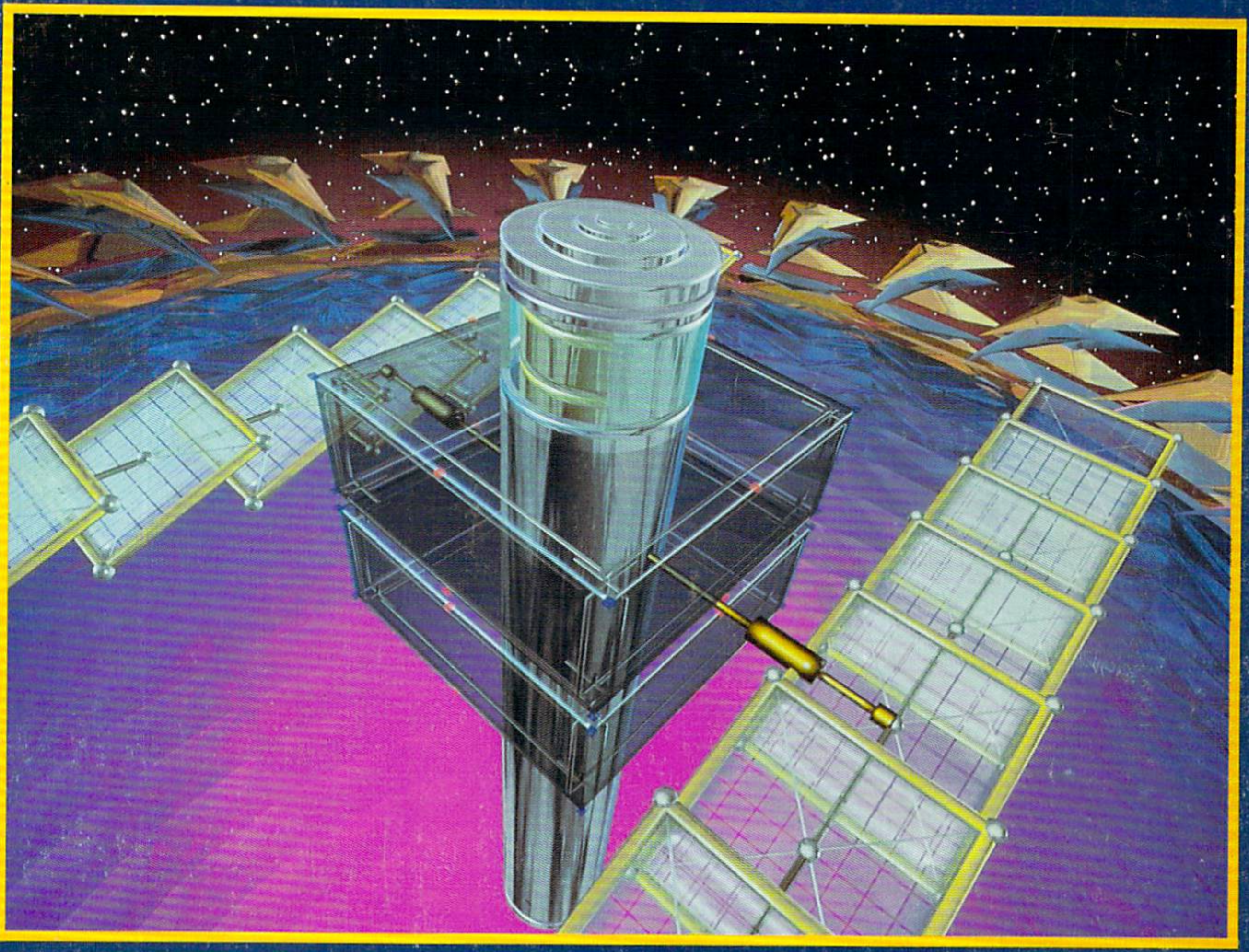
COMPUTE

JUNE 1991



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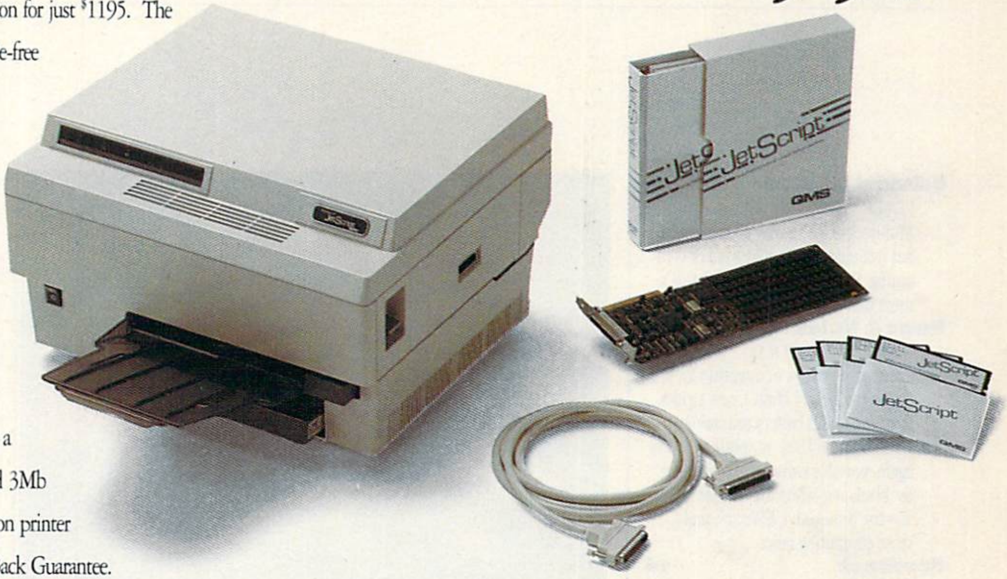

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COMPUTE

JUNE 1991 VOLUME 13 • NO. 6 • ISSUE 130

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PETER SCISCO
Multimedia isn't a new phenomenon, but it could usher in a new era of computing. We have to recognize that it's more than just the sum of its parts.

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ALAN R. BECHTOLD
Compaq's window of opportunity, a laptop (with *DeskMate!*), new strides in memory and battery technology, Microsoft and IBM on speaking terms again, portable software, digital color for black-and-white movies, tennis servers, diminutive *Sidekick*, and more computing news.

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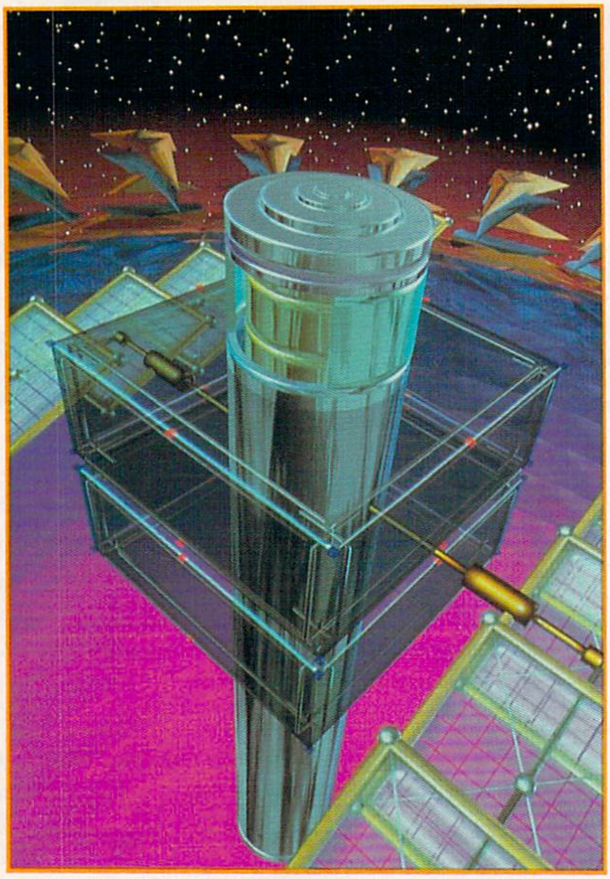
Make Way for Multimedia! 20
DAVID ENGLISH
Live video in a window on your PC screen? Six hundred megabytes of information on a slender 5-inch disc that can simultaneously play back text, graphics, video, animation, recorded sounds, and synthesized music? Those are just some of the promises of a powerful set of extensions to *Windows* 3.0 that Microsoft will release this year.

SharePak 28
RICHARD C. LEINECKER
This month's *SharePak* disk contains two powerful programs to help you cultivate a healthy body and a third program that might help you schedule events so that they are more harmonious with your life.

Virtual Reality 30
GREGG KEIZER
Virtual reality describes a swarm of futuristic technologies with even more futuristic applications. Among the dreams of virtual reality are robots to probe crippled fission reactors; classrooms that can explore the inner workings of thunderstorms, combustion engines, or the nuclear furnace of the sun; and entertainment for millions.



ON THE COVER

This issue's cover is an image from *The Mind's Eye—A Computer Animation Odyssey*, a 40-minute video by Seattle-based Miramar Productions. Brad Hunt and Mario Kamberg used a Cray XMP supercomputer to create the image, which is completely computer generated and has a resolution of 8,000 × 6,000 with 4,000,000 colors.

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Nine Printers in Grueling Tests 33
In this issue's Test Lab we benchmark and review a range of dot-matrix, bubble-jet, color, and laser printers. Included are Canon's BJ-10e and BJ-330, Fujitsu's DL4600, the NEC Pinwriter P6200, The Printer Works JetScript-CX, Qume's CrystalPrint Express and CrystalPrint Publisher II, and Star Micronics' NX-1020 Rainbow and NX-2420 Multi-Font.

TECH SUPPORT

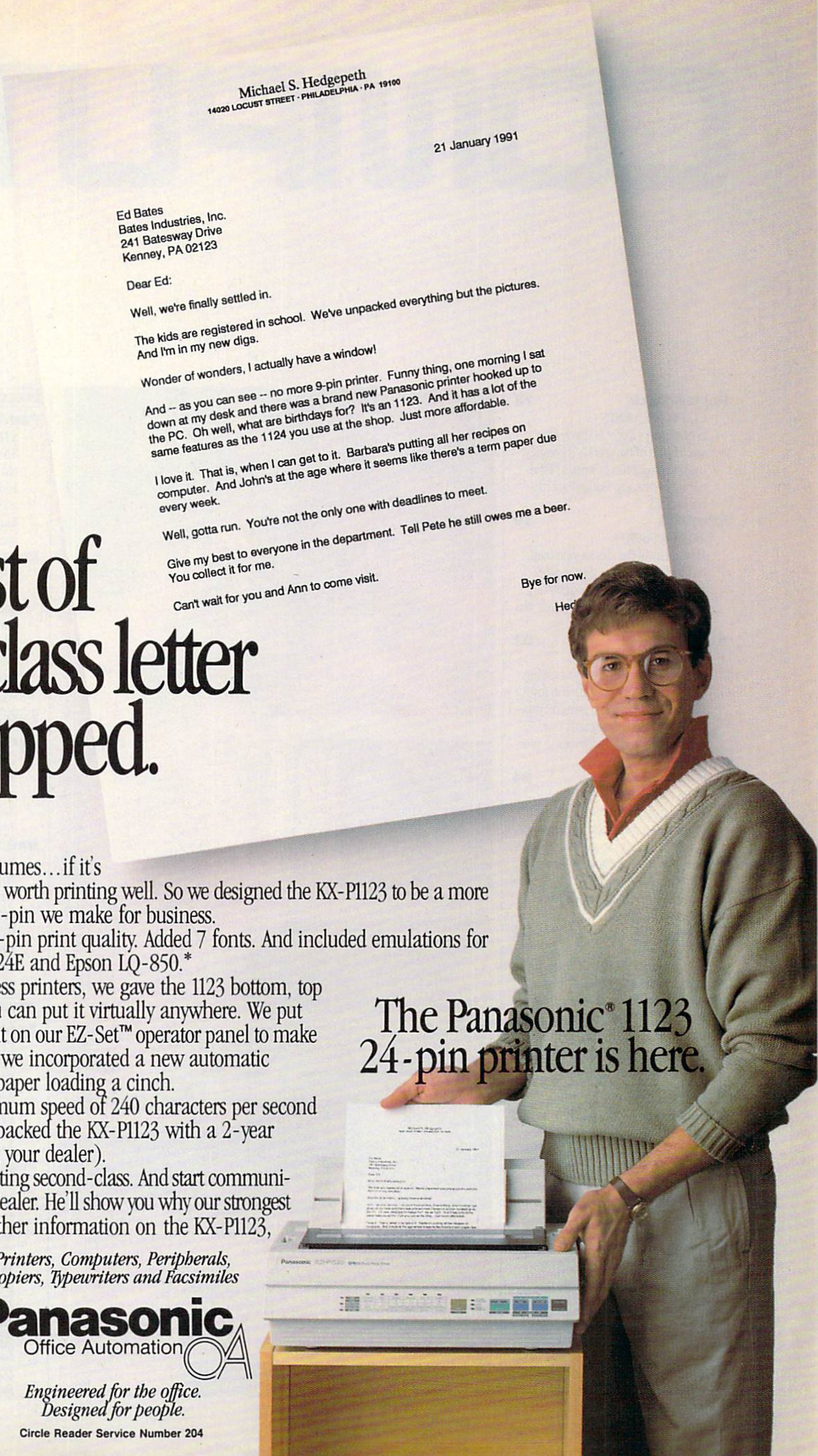
Supercharge Your PC 62
STEVEN J. VAUGHAN-NICHOLS
If your PC isn't fast enough, don't give up on it; supercharge it! By adding a cache, more memory, a faster hard disk, or any combination of these, you can take almost any PC from a tried-and-true 4.77-MHz machine to a state-of-the-art 386 and turbocharge it!

On Disk 69
JOYCE SIDES
Power users and novices alike will appreciate the collection of super utilities found on this issue's disk. You can do anything from repairing a disk's file allocation tables to restoring the setup data in your CMOS memory. You can even use these programs to test your floppies to see if there are any system, data, or file errors.

Tips & Tools 72
READERS
Getting 400 percent from *PageMaker,* preventing the most common forms of viruses from infecting your boot sector, and tuning up your batch files.

Programming Power 73
TOM CAMPBELL
QuickBASIC used to be the *only* BASIC for PC programmers. But there's a new kid on the block that's going to give Microsoft a run for its money. This new BASIC is the reincarnation of *Turbo Basic* with a new name: *PowerBASIC.*

Hardware Clinic 75
MARK MINASI
The very power that gives our PCs life can kill or cripple them. Here's a hands-on guide to the hardware that can protect your PC from surges, spikes, and other power nasties.



Michael S. Hedgepeth
14020 LOCUST STREET · PHILADELPHIA · PA 19100

21 January 1991

Ed Bates
Bates Industries, Inc.
241 Batesway Drive
Kenney, PA 02123

Dear Ed:

Well, we're finally settled in.

The kids are registered in school. We've unpacked everything but the pictures. And I'm in my new digs.

Wonder of wonders, I actually have a window!

And -- as you can see -- no more 9-pin printer. Funny thing, one morning I sat down at my desk and there was a brand new Panasonic printer hooked up to the PC. Oh well, what are birthdays for? It's an 1123. And it has a lot of the same features as the 1124 you use at the shop. Just more affordable.

I love it. That is, when I can get to it. Barbara's putting all her recipes on computer. And John's at the age where it seems like there's a term paper due every week.

Well, gotta run. You're not the only one with deadlines to meet.

Give my best to everyone in the department. Tell Pete he still owes me a beer. You collect it for me.

Can't wait for you and Ann to come visit.

Bye for now.

Hed

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COMPUTE

Point & Click 78

CLIFTON KARNES

Is Microsoft's *Excel* 3.0 the hottest spreadsheet of the year? Is it possibly the best program ever written? Find out why Lotus and Borland are running scared.

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TONY ROBERTS

How many of the files on your hard disk are really pulling their weight? Here's detailed advice about putting your PC on a diet by pruning your disk of useless files.

Arts & Letters 82

ROBERT BIXBY

When it comes to electronic drawing, *Windows* isn't the only game in town. Here's a look at several excellent non-*Windows* drawing programs that would make worthy additions to your artist's toolbox.

***Turbo Pascal* 6.0** 84

TOM CAMPBELL

If you've bypassed *Turbo Pascal* recently in favor of sexier languages like C and C++, take another look. The new *Turbo Pascal* packs all the punch of C, has objects like C++, and sports a polished new integrated development environment.

Online 89

DENNY ATKIN

Ever wonder what the people on the chat lines are talking about? You may have tried to follow the conversation but found it's filled with strange terms and indecipherable acronyms. Here's how to learn the lingo: chat-line shorthand and jargon.

HOME OFFICE

WorkPlace 90

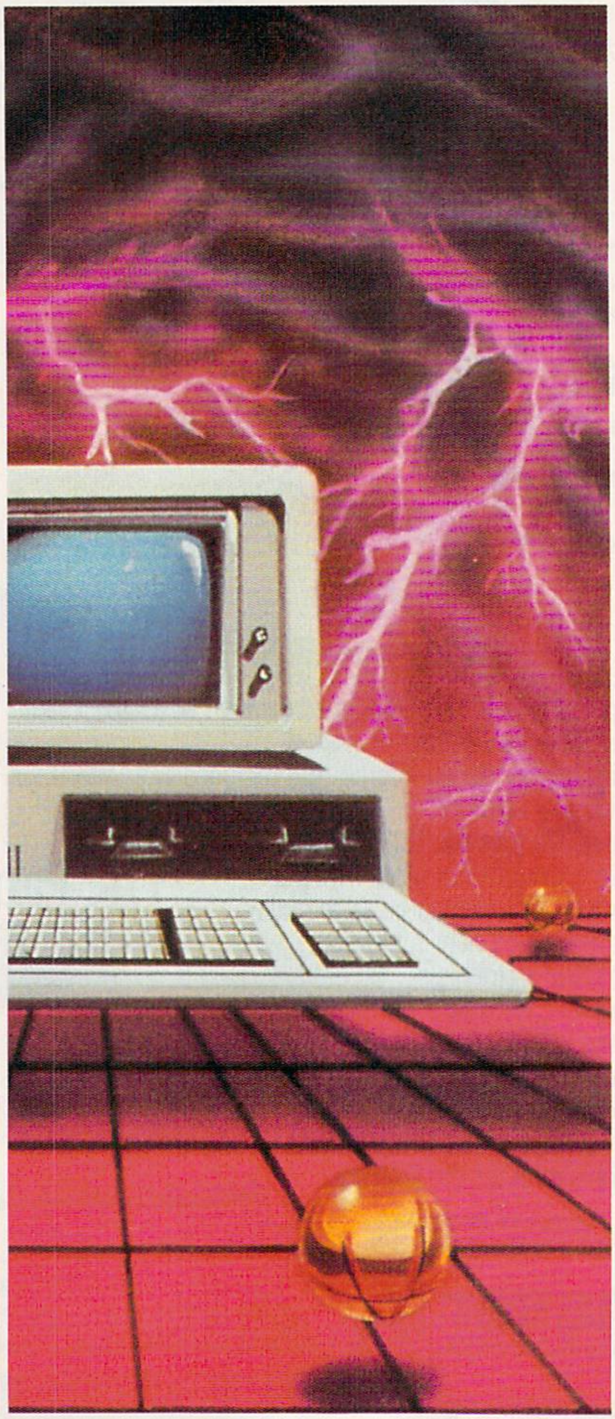
DANIEL JANAL

When your computer enters the Twilight Zone, there's only so much a good doctor can do. Preventive medicine is still your best bet against unknown mishaps—unless you plan on calling a witch doctor.

EZ E-Mail 92

GREGG KEIZER

Postal rates skyrocket. Letters take days. Electronic mail, or E-mail, can keep you in contact 24 hours a day, seven days a week. You can maintain business relationships, develop leads, and improve your productivity with round-the-clock communications.



DISCOVERY

PathWays 100

STEVEN ANZOVIN

The world has opened up for ten-year-old Dustin Webb. Now, well-integrated hardware and software ensembles allow thousands of disabled people just like him to speak, write, and communicate as never before.

Roots 102

GREGG KEIZER

If you're like millions of Americans, you can't help wondering where your family has been, what it has done, and where you fit in. Your home computer can help you keep track of your heritage by making sense of the intertwining of your lineage.

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GamePlay 106

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The strange and powerful experience of sci-fi simulation is reaching new heights of reality. *Star Control* and *Lightspeed* are dazzling examples.

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Soon you'll be able to fight the Iraq air war, or other engagements of your own design, using the incredible new *Falcon* 3.0 flight simulator from Spectrum HoloByte. Flight simulator expert Richard Sheffield puts the latest and greatest *Falcon* through its paces.

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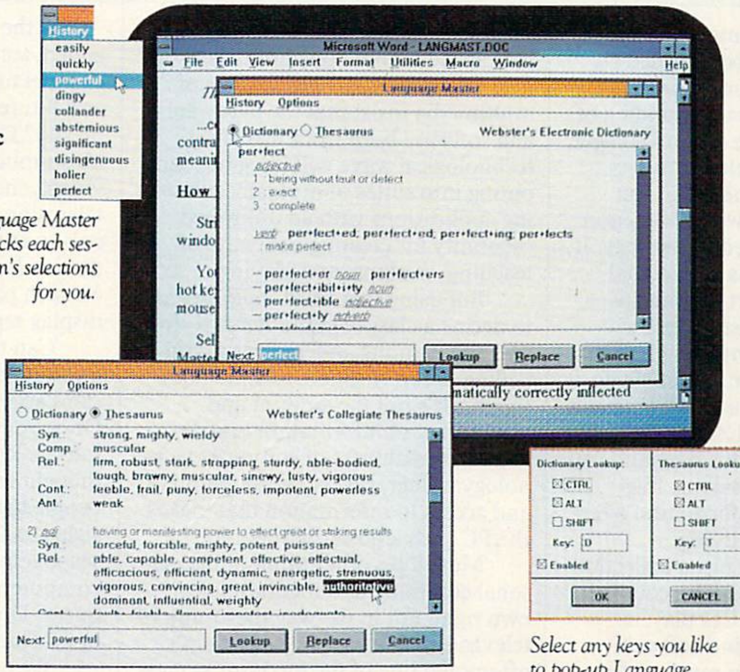

History:
easily
quickly
powerful
dingy
collander
abstemious
significant
disingenuous
holier
perfect

○ Dictionary ○ Thesaurus — Webster's Electronic Dictionary

per•fect
adjective
1 being without fault or defect
2 exact
3 complete

verb per•fect•ed; per•fect•ed; per•fect•ing; per•fects
make perfect

– per•fect•er *noun* per•fect•ers
– per•fect•ibil•i•ty *noun*
– per•fect•ible *adjective*
– per•fect•ly *adverb*

Next: perfect

○ Dictionary ● Thesaurus — Webster's Collegiate Thesaurus

Syn.:	strong, mighty, wieldy
Comp.:	muscular
Rel.:	firm, robust, stark, strapping, sturdy, able-bodied, tough, brawny, muscular, sinewy, lusty, vigorous
Cont.:	feeble, frail, puny, forceless, impotent, powerless
Ant.:	weak
2) *adj*	having or manifesting power to effect great or striking results
Syn.:	forceful, forcible, mighty, potent, puissant
Rel.:	able, capable, competent, effective, effectual, efficacious, efficient, dynamic, energetic, strenuous, vigorous, convincing, great, invincible, authoritative, dominant, influential, weighty

Next: powerful

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PETER SCISCO

If you're among the many computer users who've been bombarded by the latest technological buzzword, *multimedia*, your understanding of that term may revolve around a vague and tenuous idea of television pictures, stereo music, and a PC. But multimedia isn't a new phenomenon sponsored by advanced technology. It has its roots in various intellectual movements—from art to philosophy—that span the last 20 years.

As an art form, multimedia gathers disparate images into a single, focused vision—not as a sluice channels water, but as a laser channels light. It's particularly fitted to this postmodern world of visual impressions, fragmented narratives, information overload, and accelerated living.

Multimedia isn't just a collection of computers and programs coupled with camcorders and CD players. Computer hardware and software makers have seized on multimedia as a means of packaging products for consumers. (And that's not a criticism; it's a fact. Turn on MTV if you want to see the standards under which software—in this case, music—is packaged for your consumption.)

The most vocal proponents of multimedia insist that the hardware and software born from this latest technological wave will integrate computing into suites of mutually enhancing applications with an unlimited capability for creating new ways of teaching, working, and playing.

But using that word *multimedia* to define a class of computer activities and applications underscores a compelling, if rarely stated, axiom about the PC: It's not the amount and availability of information that defines the usefulness of computer technology; rather, it's the presentation of and access to information that makes the PC such a powerful medium.

Most folks don't think of the personal computer as a medium in its own right, not in the way they think of television, for example. McLuhan's oft-quoted line of the medium as message didn't originally apply to the PC—or did it? And if the answer to that question is *Yes,* then exactly what kind of medium is it?

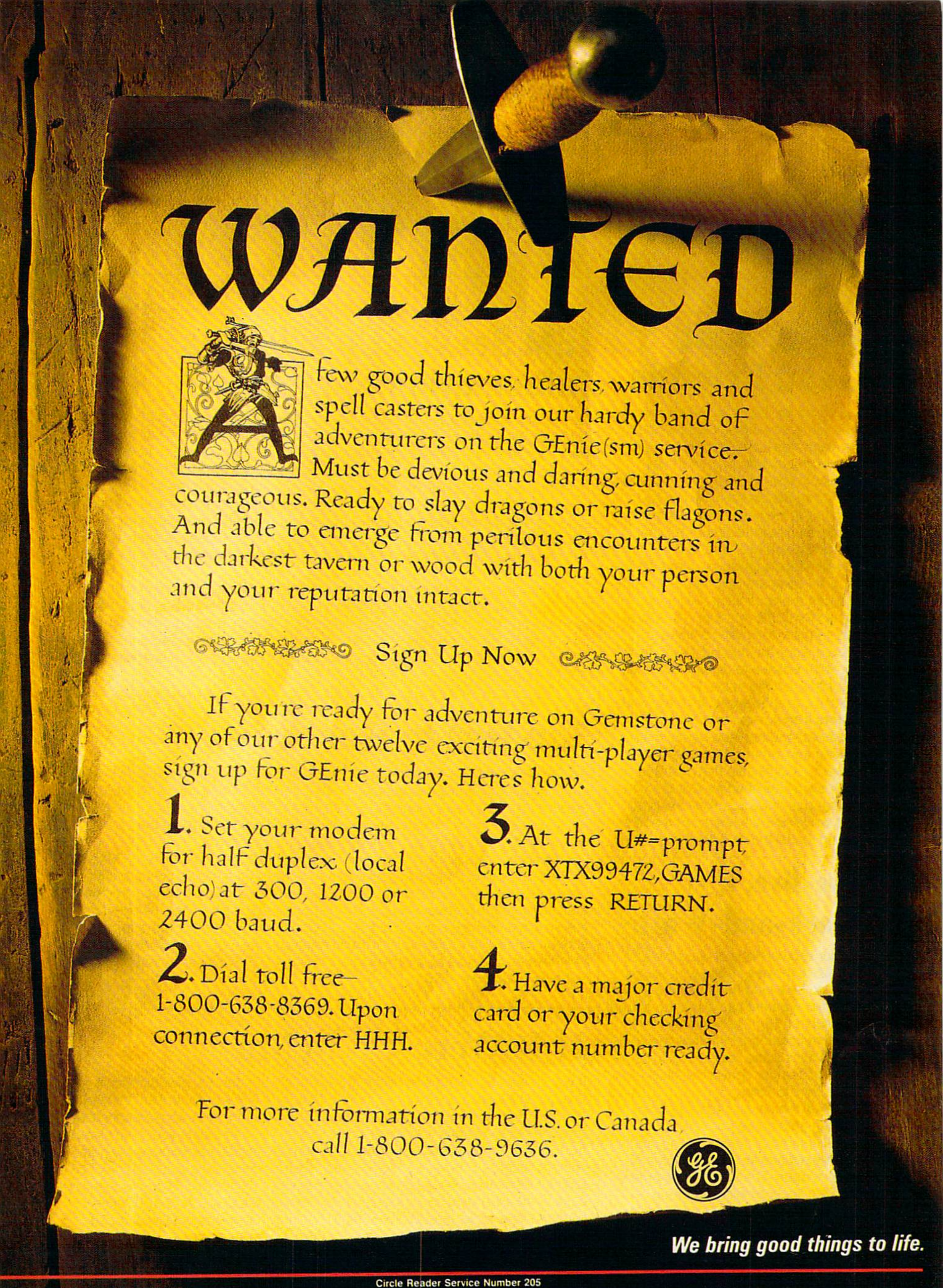
Is the PC an expansive, open-ended, technologically sophisticated channel to the world—past, present, and future? Or is it limited by its complexity? Does the PC's graphical and oh-so-modern attractiveness to the video generation make it the equal of television and film? Or is the PC's access to and manipulation of information held prisoner by its reliance on such paraphernalia as keyboards, display terminals, and floppy disks?

Can the personal computer create a society of aware citizens, with instant access to necessary information? Or does PC technology spew noise into the channel, obscuring critical thought and debate? Can the PC bring people together as a community of insights and ideas? Or will the PC landscape remain the elite domain of the computer-literate? And, the ultimate query: Does the shape of PC technology influence our view of the world?

We often limit the PC's influence by calling it a *productivity tool,* a *learning environment,* or a *game machine.* These phrases fail to consider the personal computer's greatest attribute—that it can enhance, educate, and entertain, all from within the confines of its metal casing.

You hear a lot of talk about how multimedia is the next great wave of personal computing. You also hear a lot of talk about how multimedia is just another buzzword that hypes purposeless technology at the expense of purposeful engineering. Well, here's another earful. Multimedia isn't a product. Multimedia isn't hardware or software you can buy. It isn't TV pictures and stereo music on your computer. It's the essential interplay of multiple perspectives necessary for critical thinking and creative solutions.

The writer Walker Percy launched speculations by "sidling up alongside" ideas through language and the power of metaphor. If multimedia can separate PC use from the encumbrances of technology, then we have gained a valuable perspective on the roles computers play in our lives. ⊡



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NEWS & NOTES

We're Just Good Friends

The computer press is sometimes so filled with rumors that it approaches the standards set by the likes of grocery store tabloids. Microsoft has stepped forward to deny one such rumor—that the company would soon drop OS/2, the advanced multitasking software environment currently being sold for use on high-end IBM PC–compatible personal computers.

The company said that Microsoft and IBM are continuing the joint development of OS/2. According to Microsoft, the company will continue to service, support, and sell OS/2, and will also continue to develop OS/2 applications, adding to the 11 OS/2 applications currently available. Meanwhile, rumors also abound that *Microsoft Windows,* another icon-based multitasking environment, has become so powerful and flexible that customers are feeling little need for OS/2. It could be that one of Microsoft's own products will kill OS/2 without Microsoft's having to pull the plug itself.

Bye-Bye, Black-and-White

If colorized versions of classic black-and-white movies irritate you, you're going to be a lot more irritated in years to come. A patent has just been issued to American Film Technologies for a new film-coloring technology the company claims is the only all-digital computer system for converting black-and-white films to color.

With the new technology, color assignments come from digitally selected colored picture elements and actually replace individual black-and-white images. The result, says American Film Technologies chairman George R. Jensen Jr., is a pure color image that is consistent from frame to frame.

IBM Serves Up a Tennis Information System

Tennis fans attending the IBM/Association of Tennis Professionals (IBM/ATP) Tour can just touch a PC screen and receive a wealth of data that can make watching the matches more interesting. IBM's PlayerFacts system, housed in kiosks positioned to be easily seen by arriving fans, is based on IBM Personal System/2 computers with touchscreens. Fans touch one of three screen icons to receive player biographies, learn how specific players have fared against one another, and obtain a list of past winners of the tournament currently being played. Another PS/2-based radar gun system is measuring the speed of each serve and displaying the results for fans on a large electronic scoreboard in the court area.

In the future, the PlayerFacts system will use information from the new IBM/ATP Tour MatchFacts global information system, in use for the first time this year. MatchFacts is the game's first historical, in-depth record of men's singles play. It tracks ten categories of statistics from 3000 matches played annually by 700 ranked players at 77 tournaments worldwide. IBM is the title sponsor of the ATP Tour.

Too Hot to Handle

A CD-ROM database of names, addresses, and marketing information on 120 million U.S. consumers has been deemed too hot to handle and canceled by its creators. Lotus Development and Equifax canceled shipment of *Lotus MarketPlace: Households* after an assessment of public concerns about the product determined public sentiment was too negative to overcome.

News of *Lotus MarketPlace: Households,* which was due to ship in March, led to what both companies described as "a firestorm of public concern about consumer privacy." Lotus and Equifax claimed the actual data content and controls built into the product ensured consumer privacy but decided the expense involved in educating the public to that fact would be too great. Lotus also announced that the company will discontinue shipment of *Lotus MarketPlace: Business,* a database of information on 7 million U.S. businesses that began shipping in October 1990.

If It Were Up to Me

If you've ever felt world events are totally out of your control, give *SimEarth—The Living Planet* a spin and feel better. *SimEarth* lets you control an entire planet, including the development of intelligence, civilization, and interplanetary travel. If you're not too happy with earth to begin with, you can create your own planet from scratch or use one of six other prebuilt planets. You can explore the game with no set goal or pursue specific goals, such as developing a civilization of intelligent dinosaurs or a greenhouse world to see which species survive. In either case, *SimEarth* could spell relief to anyone who'd like to feel in control, even if just for a little while. It retails for $69.95. For information contact Brøderbund Software, 17 Paul Drive, San Rafael, California 94913.

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Circle Reader Service Number 104

NEWS & NOTES

Toward a Longer Life

The computer industry is hard at work extending the life of laptop batteries. While this endeavor is certainly not as earth-shattering as, say, medical science's efforts to extend the human lifespan, its ramifications are mighty important to the growing masses of laptop and notebook PC users around the world. Phoenix Technologies' new PhoenixMISER series of power management software systems is one such development raising a lot of hopes. This is software designed to extend battery life for small PCs, ranging from high-performance, ni-cad battery–based 386 and 486 laptops and notebooks to PC-compatible palmtops based on two AA alkaline batteries.

PhoenixMISER, when combined with PhoenixBIOS, enables manufacturers to design fully functional, small form-factor PCs that not only minimize power consumption but are also 100-percent compatible with desktop PC systems. The software works in conjunction with specific power-management hardware features and can double battery life in some computers. For more details contact Phoenix Technologies, 846 University Avenue, Norwood, Massachusetts 02062.

Another Kind of Window

Laptops—especially the new smaller notebook-sized models—are selling so well that recent published reports indicate that Compaq, a leading manufacturer of PC-compatible laptop and desktop computers, can't keep up with the demand. The company's new LTE 386/20, an 80386-based notebook model, was due sometime during October 1990. Shipments are still far below market demand. Analysts believe Compaq's dominance in the notebook PC market could be seriously jeopardized if the company doesn't start shipping the new high-powered notebook PC in quantity soon. IBM and AST Research are ready to release their own comparable notebook PCs that will sell at a lower price, and Compaq's window of opportunity is closing rapidly.

Compaq's dominance in the market might erode if it can't keep up. But industry analysts Hambrecht & Quist say there should still be plenty of sales to go around. A recent report, "Portable Computing and Its Enabling Technologies," states that annual unit growth of notebook computers could exceed 50 percent through 1994. The report notes that users are beginning to demand portable computers that are smaller and lighter, yet faster and more powerful, and predicts that the notebook segment will provide the "most exciting market opportunities" in the PC industry throughout the first half of this decade.

Tandy's Newest Notebook

Tandy, often credited with creating the notebook PC genre, is now shipping a notebook-sized IBM PC–compatible that features a 16-MHz 80C286 microprocessor, VGA graphics, an internal hard disk and a floppy drive, and a battery life of up to 3.5 hours. The new Tandy 2810 HD comes standard with 1MB of RAM (expandable to 5MB). An optional Intel 287 XLT math coprocessor can also be added. The MS-DOS 4.01 operating system, Tandy's new *DeskMate* 3.5 personal productivity software, and the TEMM memory manager are factory-installed on the hard disk, and the new notebook comes equipped with an eight-ounce AC adapter/charger capable of recharging the replaceable ni-cad battery in just two hours.

The new Tandy notebook is designed to double as a desktop PC, with built-in ports for an external 101-key enhanced keyboard, an external VGA monitor, and a variety of additional peripherals. It also comes equipped with an internal slot for an optional 2400 bps modem ($199). The suggested retail price is $2,499. It's a far cry from the simple word processing and limited BASIC capabilities we saw in that earliest of all Tandy notebook PCs, the Tandy 100. For more information, contact Tandy, 1800 One Tandy Center, Fort Worth, Texas 76102.

Sidekick 2.0: Smaller and Better

Borland International has just proven that good things come in small packages by shipping *Sidekick* 2.0 PC software. The latest version of this popular personal and business organizer package is actually smaller than the previous version, but it packs more of a punch than ever before. A windowed user interface ties *Sidekick*'s five applications—*Time Planner, Address Book, Communications, Notepad,* and *Calculator*—into one integrated Terminate and Stay Resident (TSR) system. Requiring only 40K of RAM, it's also the perfect system for today's mobile office environment filled with palmtop organizers, laptops, and notebook PCs, offering a special reconciliation feature that automatically eliminates schedule conflicts for users with more than one computer.

The *Time Planner* maintains calendars and appointments that can be viewed by day, week, month, or time committed. A prioritized to-do list allows users to set warnings and due dates. Uncompleted tasks automatically carry forward to the next day until completed. The *Address Book* maintains names, addresses, and phone numbers in an easy-to-use rotary card format. It has a speed-dial feature for frequently called phone numbers. The *Communications* application is used for data calls to online services and uses the same formats and speed-dial feature as the *Address Book*. The *Notepad* is designed for writing quick memos or notations that can be attached to appointments, to-do items, or address book entries to provide supplemental information. It features adjustable margins and tabs, automatic word-wrap, spelling checker, and thesaurus.

Sidekick 2.0 supports leading local area networks (LANs), such as Novell, 3COM, IBM Token Ring/Extended Edition, Banyan, and other networks that are 100-percent compatible with DOS 3.1 or later. The suggested retail price is $99.95. Contact Borland International, 1700 Green Hills Road, Scotts Valley, California 95066.

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Sure, you want to get your PC flying. With features like multiple open applications and background printing. Maybe even the ability to maintain your host connection while you work on something else.

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PC MAGAZINE EDITORS' CHOICE
October 30, 1990
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OLÉ. A network idea whose time has come.

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Even the experts agree.

Garry Ray, writing for PC Week, said, "Of these alternative operating environments (OS/2, DesqView and Software Carousel), Carousel may be the best choice of the day."

Barry Simon of PC Magazine concurred with, "...I find it difficult to imagine using my computer without Carousel. This package has become an essential tool and one that I strongly recommend."

So if you really want the major benefits of Windows and OS/2, don't get grounded with high cost and mind-bending complexity. Take off today with Software Carousel. It's easy. And it's just $89.95.

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*Open Link Extender is sold separately. †Requires NetBIOS connection.

Circle Reader Service Number 182

Improve Your Memory

Every computer user's experienced it. You work hours on a special report or other task, and suddenly, the power goes out. Everything you've done after your last save to disk is lost. Fortunately, this scenario could change, thanks to a new nonvolatile Dynamic Random Access Memory (DRAM).

DRAMs are the most widely used type of semiconductor memory device in the world. Until now, they've all required a constant supply of power in order to maintain their memory. Ramtron's new nonvolatile DRAM is the world's first that's capable of actually retaining information without power. It's a ferroelectric DRAM that consolidates the functions performed by multiple forms of RAM and ROM into a single memory component.

The new chip operates in two modes. During normal operation, the ferroelectric storage cells hold data in the form of electrical charges identical to conventional DRAMs. When power fails or is otherwise removed, the ferroelectric storage cells are polarized to save data indefinitely without power. The company claims its new DRAMs set the stage for a fundamental change in the way computer systems are designed. For more information, contact Ramtron International, 1850 Ramtron Drive, Colorado Springs, Colorado 80921.

A Standard Standard?

Techbyte International's new Software Portability Environment could become a computer standard that defines all other computer standards. Lack of software portability has long been a problem in the computer industry because most computers won't run software written for other computers. The Software Portability Environment is designed to end all that.

Techbyte International demonstrated its new system by using it to run the same software package on an Apple Macintosh LC and an IBM-compatible computer. The new system will, for example, allow educational software developers to produce applications software for multiple computer platforms with only one development effort.

The Software Portability Environment will be marketed under the name *VSE System.* For more information, contact Techbyte International, 4025 Woodland Park Boulevard, Suite 380, Arlington, Texas 76013.

The Fine Art of Computing

The computing world and the art world have come together to offer art collectors of all kinds the opportunity to examine the development, cultural implications, and financial activity of over 1000 different art forms with a higher level of scholarship. ArtFact has unveiled a new CD-ROM–based database called *ArtFact* that compiles information from worldwide art auction house results, providing a database for unearthing patterns in a particular object's aesthetic development.

Company founder and president Stephen Abt said, "We set out to create a tool which could support a fundamental advancement in the way users learn and think about art." Abt sees a healthy market for the service among art and antique dealers and collectors, museums, libraries, news agencies, personal property appraisers, insurance companies, and estate planners. An annual subscription will cost $4,500, with each additional year costing about half that much. Abt said, "The price may strike people as being a bit high, but buying all the current auction catalogs and reference materials from which the data is compiled would easily cost $70,000 or more." Contact ArtFact, 1130 Ten Rod Road, North Kingstown, Rhode Island 02852.

Making His Own Record

Borland International customers and friends got an eyeopener (actually an ear opener) of a Christmas gift last year. As part of a special holiday promotion, Borland distributed several thousand copies of a jazz compact disc as a holiday gift. It wasn't just any jazz CD, either. Titled *Pacific High,* the CD featured Borland chief executive officer Philippe Kahn and a number of noted jazz artists, including John Abercrombie, Alex Acuna, Richie Beirach, Paul Contos, David Eshelman, Billy Hart, Ray Kane, Dave Liebman, and Ron McClure. On the CD, Kahn plays tenor saxophone and flute.

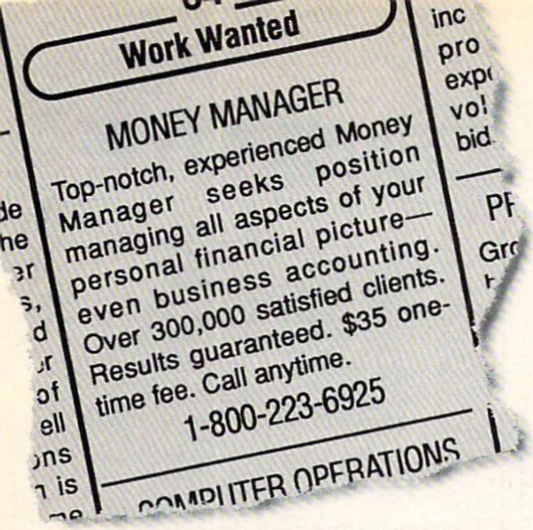
"Proceeds from any sales of the CD would go to benefit AIDS research," said Kahn. "However, there's an important corporate message in using this CD. *Pacific High* musically applauds the innovations in technology that were developed in the Silicon Valley and Pacific Rim. We are saluting, through a combination of jazz and rap pieces, the powerful contributions the developers of the personal computer have made to global communications."

High-Tech Mice

Logitech, one of the world's leading producers of computer mice, says it's time for a change. The company is just shipping a new family of computer mice that incorporates what it refers to as an uncommon level of attention to ergonomics.

For the first time, the company says, computer users will be offered new options based on their individual physical needs. By providing a range of choices, the company expects to recast current retail marketing for PC peripheral products.

"News & Notes" is by Alan R. Bechtold, editor of *Info-Mat Magazine,* an electronic news weekly published by BBS Press Service. ◘



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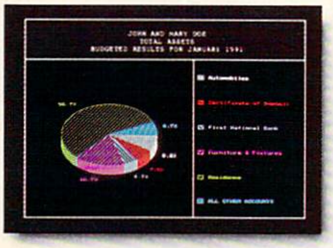

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FEEDBACK

Back Up Batman!

I would like to know how to make backup copies of games like *Batman, Contra,* and *Arkanoid II*. Also, could you give me the address of Computer Business Solutions?

TRAVIS MAY
BROOKDALE, MB, CANADA

Publishers of computer games generally don't like to have users make copies of their disks—even for backup. The DOS DISKCOPY command might work, but most game publishers employ copy protection that prevents making a working copy (though all of the files might appear to be copied). Even that nonworking copy would be illegal, however, so we advise you not to try. If you accidentally ruin your original disk, most companies will replace it for a nominal fee.

In answer to your second question, Computer Business Services is located at 508 East 6th Street, CBC Plaza, Sheridan, Indiana 46069.

Exhuming Decrypt

Kirk Leslie of Enoree, South Carolina, wrote to "Feedback" a few months ago looking for a program called *RCRYPT.* RCRYPT.COM was on the MS-DOS 3.30.20 supplemental disk that came with my Tandy 1000SL. The syntax is RCRYPT *pathname1* [*pathname2*]. If you enter *pathname2,* the encrypted file will be written to disk. Otherwise, the file will be sent to the screen. When you enter the command, you will be prompted for a 0–8 character encryption key.

JOHN C. SLOAN
DUBUQUE, IA

Child's Play

I've read with great interest the articles in *COMPUTE* on children's games and educational software. Two of the leading companies appear to be Brøderbund and The Learning Company. Is their software available in the United Kingdom? If so, could you please let me have an address of a supplier?

If these programs aren't available in the U.K., perhaps you could list the address of these companies so that I can contact them directly.

BRIAN MOODY
BUNGOMA, KENYA

Brøderbund's distributor in England is called Brøderbund England. To place an order, call 01-780-2222. Its United States customer service number is (800) 521-6263.

The Learning Company doesn't have a distributor in the U.K., but you can call its toll-free number, (800) 852-2255, or write 6493 Kaiser Drive, Fremont, California 94555, to place an order.

Dynamic Context

Could you clarify the difference between context switching, dynamic memory management, and multitasking?

HSIN TU
N. HOLLYWOOD, CA

Context switching, dynamic memory management, and multitasking are all methods for expanding the power of your PC. Programs that context-switch allow you to switch freely among (sometimes) dozens of programs. When you switch from one program to another, the memory used by the exiting program is saved to disk, and the location of the information about that program is stored by the context switcher. Then the entering program is brought into memory. When you switch back, the second program and all the memory it has used are saved to disk, and the first program is loaded from disk. The program being brought into memory appears not to miss a beat, but in fact, it has been dormant all the time it was stored on disk.

Multitasking involves having more than one program running at the same time. Generally, this means that all the running programs have to be in memory simultaneously, but thanks to new technology called dynamic memory management, *this is no longer necessary with some machines. Computers with 80386 and 80486 CPUs can treat hard disk space as if it were memory, swapping out parts of pro-*

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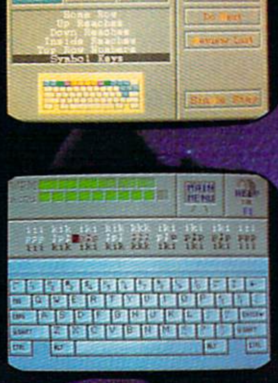

IBM Screens Pictured.

To order Dvorak on Typing™, call 1-800-969-GAME. Available on MS-DOS for $49.95. Coming soon on Amiga and Macintosh.

Interplay™

Interplay Productions
3710 S. Susan, Suite 100
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(714) 549-2411

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Circle Reader Service Number 155

grams that are momentarily inactive so that more programs can be managed in RAM. The system works well in theory, but it requires a lightning-fast hard drive, and even with the fastest equipment, OS/2 (the operating system that makes use of dynamic memory management) has shown itself to be disappointingly slow.

Generally, multitasking is accomplished by assigning a certain period of CPU access time to each of the running programs. Windows *and OS/2 take the strategy of assigning a set amount of time to each running program, even if one of the programs is idling. This results in a loss of access to programs that really need CPU time.* GEOS, *according to GeoWorks, allots time according to each program's need. Supposedly, this results in more efficient operation. However, try this with* Windows *and* GeoWorks Ensemble: *Start up the word processor, write a few lines, send what you've written to the print spooler, close the word processor, and immediately start playing solitaire. Whereas* Windows *will spool the document to the printer in a few seconds, you will have a long wait before the document is printed in* GeoWorks Ensemble. *To be fair,* GEOS *is new and probably has a few problems to iron out.*

Mirror, Mirror

In order to get a certain graphic character of the IBM 255-character set, I can hold down the Alt key and enter a number on the numeric keypad. Is there a way to tell the computer to switch the character set so that when I press the A key, for example, I can get the smiling face?

Also, I'd like to write a routine that enters text backward as it's typed in, so that when you type the word *secret,* it appears on the screen *terces.*

FRANCIS BARRETT
NEWTON, NC

Older computers like the Commodore 64 allowed you to copy the character set from ROM to RAM and modify it, but the PC's not as flexible. You can redefine the upper 128 characters by setting a pointer to a new table of definitions. That won't work on a mono or Hercules system. The first 128 characters can't be redefined on any system. Here's a simple BASIC routine that will make the translation you want within a program:

```
O$ = “AaBbCc”
N$ = CHR$(1) + CHR$(2) +
   CHR$(3)
GetText:
A$=INKEY$
IF A$ = “ ” THEN GOTO GetText
FOR I = 1 TO LEN(O$)
IF A$ = MID$(O$,i,1) THEN A$ =
   MID$(N$, INT((I + 1)/2),1)
NEXT
PRINT A$;
GOTO GetText
```

Within word processors, you might be able to write a series of macros that have the same effect. Unfortunately, there is no way to make this work at the command line.

Here is a brief routine that accepts text input, then places it on the screen in reverse:

```
CLS
GetText:
A$ = INKEY$
IF A$ = CHR$(13) THEN GOTO
   Finish
IF A$ = “ ” THEN GOTO GetText
B$ = B$ + A$
C$ = A$ + C$
LOCATE 10, 20: PRINT C$
GOTO GetText
Finish:
```

Note that C$ contains the input in reverse and B$ contains the input in its proper order as typed.

The Keys to Speed?

Where can I find a keyboard with a faster alternative layout, such as Dvorak or Maltron, for my computer? Also, once I do find such a keyboard, where do I get an operating system to fit it?

STEPHEN WALLACE
TORONTO, ON, CANADA

As your letter suggests, the QWERTY keyboard, with which we are all familiar, was not built for speed. Despite increasingly sophisticated typewriters, and now computers, the keyboard layout we use remains the same.

In the 1930s August Dvorak, a cousin of composer Antonin Dvorak, developed a more efficient layout in which the right hand and the left do equal work, the strongest fingers do the most work, and a majority of the typing takes place on the home row.

Despite this improvement and the more recently developed Maltron alternative, the world isn't ready to unlearn QWERTY and try something new.

Fortunately, though, computers make it possible for individuals to make the switch if they choose. You don't need a new keyboard, and you don't need a new operating system. All you need is software that remaps your keyboard.

Borland's SuperKey, *a keyboard macro program, provides a facility for creating and developing alternative keyboard layouts. The package even includes a Dvorak layout that's ready to load and use.*

If your physical keyboard has key caps that pop off, you can rearrange the keyboard; otherwise, use stickers of some sort to relabel the keys while you're learning the new positions. Just be sure the stickers don't come loose and slip between the keys, gumming up the works.

If you can successfully learn the new layout, you'll be the fastest typist on the block, but we wonder whether speed should be the overriding issue.

A lot of computer work these days involves editing and manipulating data rather than simply entering data en masse. Much of today's computer work requires careful consideration—something that's not possible at 200 words per minute.

Redrawn Plans

Richard Overby's letter in the March 1991 *COMPUTE* asked for the name of software that could be used to create floor plans. One option he could explore is *Dream House Professional* from Editor's Choice Software, P.O. Box 9096, Seattle, Washington 98109; (800) 641-1116. It costs $79.95 plus $4.95 for shipping. The order numbers are #DHP21-5 for 5¼-inch disks and #DHP21-3 for 3½-inch disks.

THOMAS L. ACKERMAN
OAKLAND, CA

Cutting Off the Hackers

We have stand-alone PCs in our college computer lab. Students often steal the programs and change the AUTOEXEC.BAT file. Is there any way we can protect our hard disk?

JAGPAL S. TIWANA
TRURO, NS, CANADA

Protecting files on shared PCs is a difficult problem, and in many cases the

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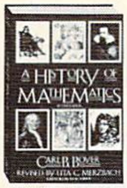

100. This revised 1968 classic offers an overview of mathematics and mathematicians.

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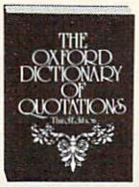

*482. This latest edition of the famous dictionary has 40,000 memorable quotations.

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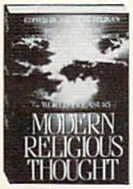

*128. A fascinating collection of modern religious, contemplative and inspirational writing.

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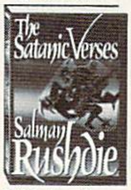

*406. "A roller-coaster ride over a vast landscape of the imagination" —*London Guardian.*

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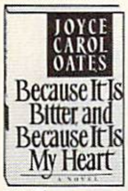
QPB: $9.95



617. The newest novel by this critically acclaimed writer is charged with sexual and racial tension.

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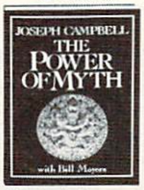

423. A scholar on mythology tells how myths have shaped our lives. A PBS TV series.

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223. Imagine Leonardo da Vinci using puppies for paintbrushes and you've got Larson's new Far Side book.

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*248. New 1991 edition. What to write, how to write it and where to sell it.

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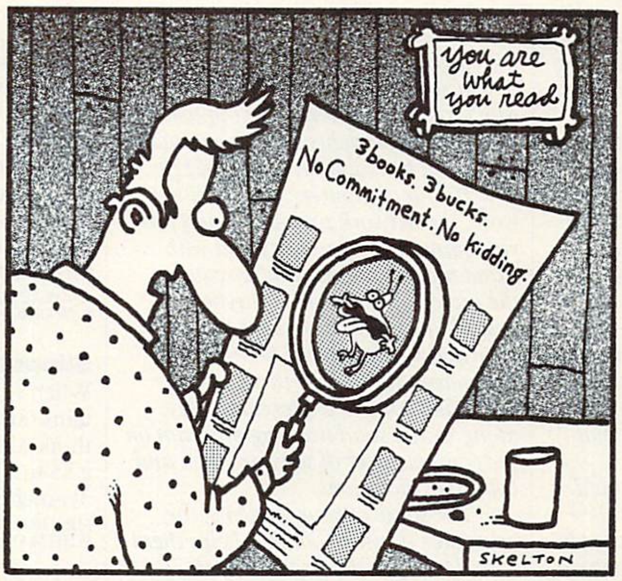

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Harold looked for the small print but couldn't find any. Though he did discover a new strain of bacteria.

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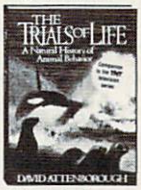

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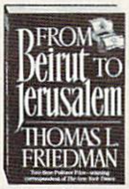

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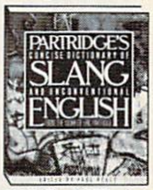

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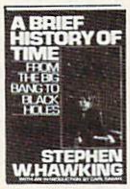

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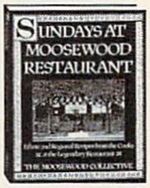

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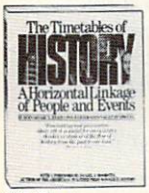

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FEEDBACK

cure is worse than the disease. A password system might allow you to prevent students from copying or removing files, but administering the password system might take more time than it's worth.

Digital Research's DR DOS, *an outstanding replacement operating system for MS-DOS, has a password feature with a variety of options that might prove useful. In addition,* DR DOS *offers excellent memory-management features and several extensions to MS-DOS, while remaining fully compatible with the traditional operating system.*

With such a system, you should be able to password-protect AUTOEXEC.BAT so no one could change it, but an enterprising or mischievous student could boot the system from a floppy and, using commonly available utilities, locate the protected file and modify it.

You could try to outsmart those bent on vandalism by tossing them a red herring. This involves modifying the COMMAND.COM file on your hard disk. Before you begin, make a backup copy of COMMAND.COM and have a bootable floppy disk available in case something goes awry.

What you'll do is edit COMMAND.COM so it loads another file rather than AUTOEXEC.BAT on startup. Put your startup instructions in that file, and the system simply ignores AUTOEXEC.BAT.

Using a disk-editor program, such as The Norton Utility, *load COMMAND.COM and search for the characters* AUTOEXEC.BAT. *Using the editor, change these characters to the name of your substitute startup file. You should use the same number of characters, but you can use an extension other than* BAT, *if you like.*

Write the changes to disk. Then using an enhanced ATTRIB program, make your substitute startup file invisible by setting its hidden attribute. You'll need a third-party ATTRIB utility because the standard MS-DOS ATTRIB command only permits changes to the archive and read-only attributes.

If you ever need to change the startup file, remember to unhide it first so your editor can access it.

Now you're set; the system boots from the invisible file. Changes made to the old AUTOEXEC.BAT, which is left hanging around the root directory, will have absolutely no effect.

It sounds like it might work, but it won't take long before your inquisitive, enterprising students smell a rat and figure out the solution to this puzzle.

If your computers were on a network, the network software would provide some level of security, but with stand-alone systems, you're really at the mercy of your users. Maybe the best solution is to give them some responsibility for the well-being of the computers and to give them some space and time to explore and play, along with a solid training program on the consequences of software theft and copyright violations.

For some of your students, the computer is just a tool that helps them complete a job. For a few others, though, and for many of our readers, the computer is a never-ending challenge, an ever-changing puzzle, and a door to uncounted hours of exploration and experimentation.

More Reviews

I've been a *COMPUTE* subscriber for several years, and I've noticed that there are now fewer MS-DOS–specific reviews. It would be greatly appreciated if you would increase the attention you give to MS-DOS products. Other than that, *COMPUTE* continues to be one of the most informative and objective computer magazines on the market.

GINO FRABONI
COBALT, ON, CANADA

You will be glad to hear that we at COMPUTE *recognize the expanding role of the PC in the home business, education, and entertainment markets and have responded with increased coverage of MS-DOS hardware and software in features, columns, and reviews. Two examples of this are our new Tech Support section, which offers technical advice on PC hardware and software, and our new Test Lab, which features in-depth reviews of the latest PC hardware.*

Enabling Technology

I am writing in response to an article titled "Building Bridges" by Howard Millman (*COMPUTE!*, February 1990). This article made some very good points about the technology used to help the handicapped.

I agree with the author that the government doesn't see programs for the handicapped as glamorous. I feel that this is because there isn't enough publicity for these programs. If there were more advertising for programs to help the disabled, the public would realize how much these programs are needed and would urge government officials to provide more of them.

ANDRAE SINGH
S. OZONE, NY

Slipped Disk

When I purchase a program that contains only a 5¼-inch disk, I don't think it's fair for companies to charge a $5 to $10 handling fee to provide a 3½-inch version.

MRS. IRA CRIPPS
WHITMAN, MA

It may sound ridiculous, but the special handling necessary to replace disks may actually cost a company $5 to $10. The other alternative would be to ship both disk sizes in the same package. This is the best solution for the consumer, but software companies may worry that it encourages piracy. One company included 5¼-inch and 3½-inch disks in the same package and then required that the unused disks be returned with the registration card. There is probably no perfect solution to the problem, but your point is well taken: It's a tremendous inconvenience to swap disks with the manufacturer. Talk to your retailer about stocking both versions. He or she might be willing to special-order 3½-inch versions of software for you.

System Sleuth's Number

In "Is There a Doctor in the House?" (April 1991), the telephone number for Dariana Technology, publishers of System Sleuth, *is incorrect. The correct number is (714) 994-7400. We apologize for any inconvenience this may have caused.*

Readers whose letters appear in "Feedback" will receive a free COMPUTE's PC clock radio while supplies last. Do you have a question about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Write to COMPUTE's PC Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions.

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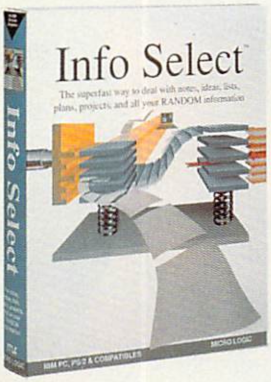
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When Harry calls you on the phone, you'll display the six windows on Harry before he finishes his first sentence! No more embarrassing pauses or scrambling for information.

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Were you born with a memory situated squarely on the tip of your tongue? Do you forget things like which day you placed an order or important numbers? If you are forgetful you especially need INFO SELECT - the software that remembers almost everything for you.

Thinking tool

Have you ever worked on a complex project and felt lost? With INFO SELECT you'll group, scan, and cross search through all your notes so fast you'll see the big picture in seconds.

Will I be better off doing this now or that later? Keeping priorities straight can make or break your career or your business. INFO SELECT lets you keep on top of what's hot.

Should you use an east or west coast supplier? To make decisions you need facts. Now you can view the facts any way you like ... as fast as you can think. You'll make the best decisions ever -- and fewer expensive mistakes.

Phone notes

Client info

Decisions

Management

The #1 PIM

What's all the fuss about PIMs (Personal Information Mangers)? Simple - you probably have more RANDOM information than any other type and you need a PIM to properly handle this kind of information. The right PIM will save you time and make everything you do go smoothly.

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INFO SELECT is memory resident (if you choose), so you can quickly jump in from other programs. Info Select windows can hold: notes, plans, lists, facts, letters, contacts, and much more. You can search for a window or a group of windows related by a word or phrase. There are five ways to see overviews; hypertext, a fast sort, and line drawing. Save time with the dialer, date tickler; and searching by text or date ranges.

If you have notes, ideas, contacts or other unorganized RANDOM information, you need Info Select.

Info Select allows you to: add columns of numbers; store data in EMS; use template or free-form windows; import and export files, screens, and databases; move, join, and duplicate windows and much more.

LAN option

The new LAN version allows integrated E-mail, sharing company rolodexes and distributing company policies. You can share any kind of information. It's your first step into the exciting new world of groupware! Ask about the five node LAN starter pack.

Easy power

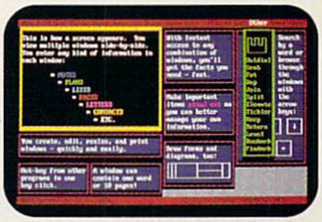
Info Select is easy to use yet offers the power you need with infobases up to 10 megabytes; text searches up to 700kb/sec; up to 32,000 characters per window; and up to 64,000 windows per infobase. Even better, Info Select can swap down to as little as 7K memory!

TORNADO owners

INFO SELECT is based on the pioneering TORNADO™ software PC World called "Excellent, Excellent, Excellent, Excellent" and PC Magazine awarded Editor's Choice - twice. Call about our special trade-up offer.

Endless uses

Info Select can do much more than manage all your RANDOM information. Use it to manage business correspondence, sales leads, orders, and client notes. Track facts, plan projects, or interrelate all your ideas. You can catalogue parts, documents, and inventory items. Match buyers and sellers or doctors and patients. Setup an information desk. Edit E-mail. Store notes on magazine articles, software operation techniques, or just names and addresses. Whether you are a lawyer tracking court cases or a zoologist collecting feeding habits you'll find countless uses for Info Select.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- CONTACTS
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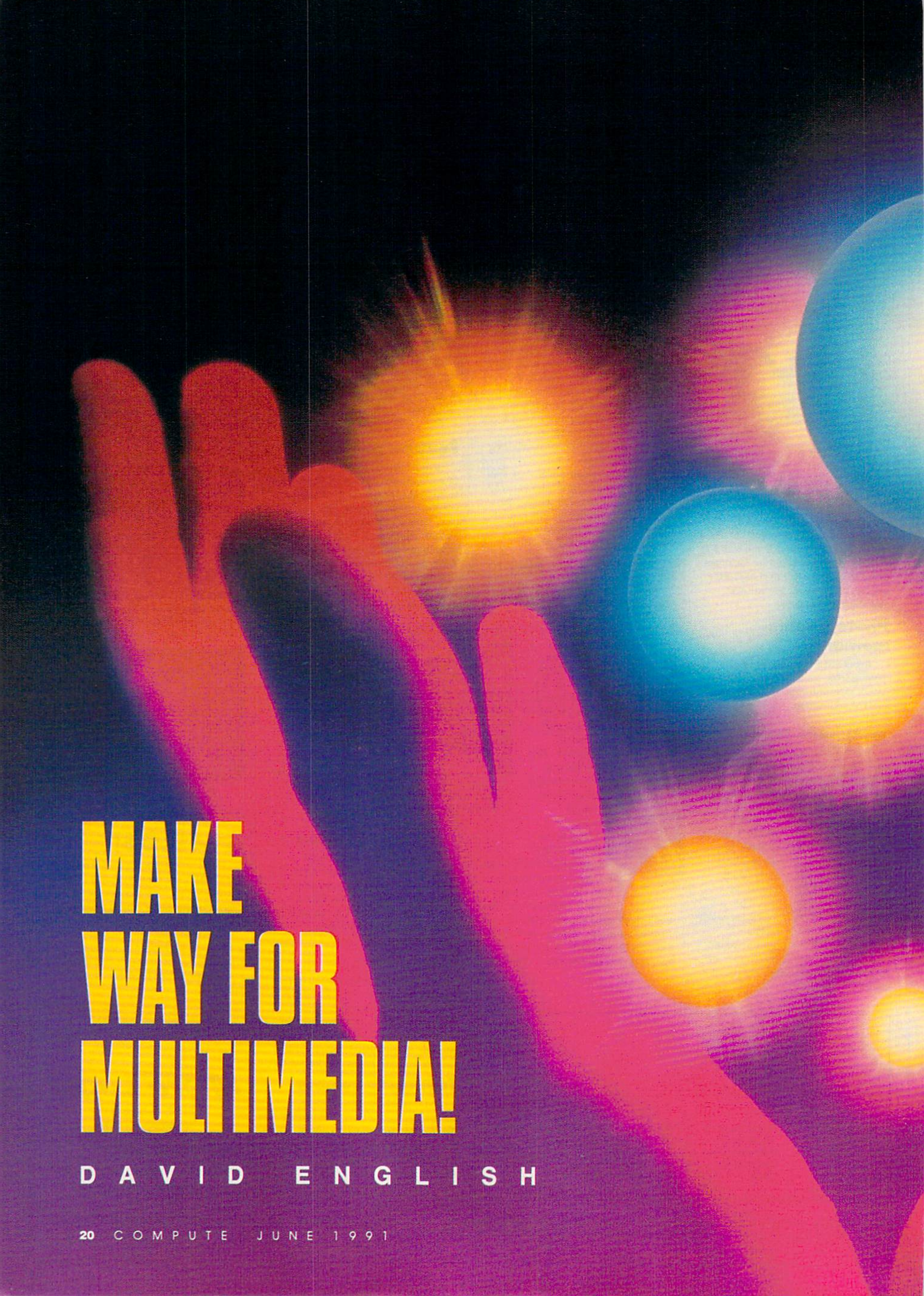


MAKE WAY FOR MULTIMEDIA!

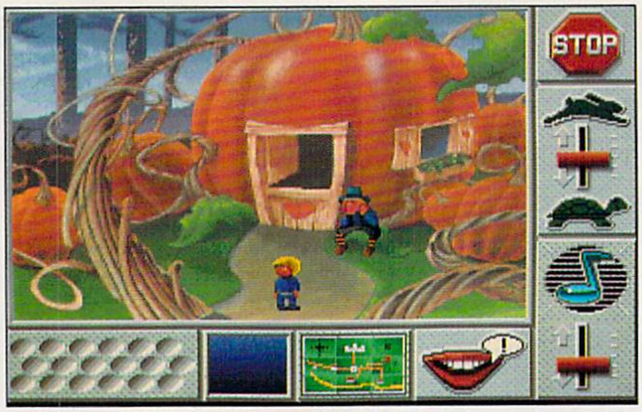
DAVID ENGLISH

THE IMAGE BANK

MOVE OVER, MAC AND AMIGA— MULTIMEDIA HAS COME TO THE PC

How would you like to have live video playing in a window on your PC screen? Or a high-fidelity voice speaking from your favorite program? Or 600 megabytes of information on a slender five-inch disc that can simultaneously play back text, graphics, video, animation, recorded sounds, and synthesized music? That's the promise of a powerful set of extensions to *Windows* 3.0 to be released this year. ▹

To run *Multimedia Windows,* you'll need at least a 286 10-MHz system with VGA graphics, 2MB of RAM, a 30MB hard drive, and a 1.44MB 3½-inch floppy drive. You'll also need a CD-ROM player with a speedy 150K-per-second transfer rate and a sound card that can handle both multichannel MIDI data and 8-bit audio. The sound card will not only be able to play synthesized music and electronic sound effects, but also spoken voice, recorded music, and real-life sound effects.



***Mixed-Up Mother Goose,* from Sierra On-Line, demonstrates many features that will be standard with multimedia.**

Only a few of today's CD-ROM players are fast enough to meet the 150K requirement. These include models from Toshiba, Sony, and Hitachi—but more are on the way. The Sound Blaster from Creative Labs currently meets all the sound card requirements—with the exception of an onboard mixer (this lets your software control the various sound levels). Future versions of the Sound Blaster will include the mixer. Fully compliant sound cards from other companies are also in the works, including a new high-quality sound card from MediaVision.

Specially priced upgrade kits designed to bring present PC owners up to speed will be available from Headlands Technology, MediaVision, and Creative Labs. These kits will include a CD-ROM player, a sound card, and Microsoft's multimedia extensions to *Windows.* Expect these kits to retail for $900–$1,500.

To deliver complete multimedia hardware systems for new buyers, Microsoft has lined up some of the biggest names in the industry, including Tandy, NEC, AT & T, Zenith, CompuAdd, Olivetti, and Fujitsu. These companies sold over 25 percent of the PCs shipped in 1990 and represent a substantial commitment to a platform with no existing software. IBM will also support the new multimedia extensions through its OS/2.

Where's the Beef?

To drum up support for *Multimedia Windows,* Microsoft sponsored a two-day Multimedia Developers Conference last November. The goal was to convince software developers to create enough applications to make *Multimedia Windows* a success. One Microsoft representative went so far as to tell the developers they had the power to embarrass a lot of big companies: "If you want to make these companies look stupid, don't write any multimedia programs."

What will the new applications look like? At the conference, Microsoft gave developers a sneak preview of some of the programs that will be released at the same time as *Multimedia Windows,* including multimedia versions of Asymetrix's *ToolBook,* Authorware's *Author ware Professional,* Owl International's *Guide,* AimTech's *IconAuthor,* Attica Cybermetrics' *MediaBase,* and Access Technology's *Windowcraft.* These are authoring programs that will allow nonprogrammers to create multimedia presentations and stand-alone multimedia programs. All these programs support CD-ROM players and sampled sounds. Most of these programs also support MIDI synthesizers, full-motion video in a window, and playback of animation files.

Initially, there will be two ways to bring animation files over to *Windows.* MacroMind showed a program that plays *MacroMind Director* files on the PC (letting you bring complete multimedia files from the Macintosh over to *Windows*). Autodesk announced a similar program that plays *Autodesk Animator* files in *Windows.* Both programs can be linked to other *Windows* applications. For example, you could write a script in *ToolBook* that calls an animation file and runs it in a window in the upper left corner of the screen.

Microsoft showed two of its own multimedia programs, *WinDoc* and an unnamed talking-heads program. *WinDoc* is yet another multimedia authoring program, but one optimized

Opening Windows

Just when you figured out how to use *Windows* 3.0, here comes a new version with even more features. *Multimedia Windows* will include *Windows* 3.0 plus the multimedia extensions to *Windows.* These extensions will add support for digital-waveform audio files (for realistic-sounding voice, music, and sound effects), MIDI music files (for synthesizer-based music and sound effects), Macintosh-based *MacroMind Director* multimedia files, various external devices (including CD-ROM and videodisc players), joysticks, and high-resolution 256-color VGA graphics.

A new Multimedia Control Panel will replace the current *Windows* Control Panel. Besides including all the previous functions, the Multimedia Control Panel will let you configure display drivers, external devices, joysticks, and MIDI settings. You'll also be able to choose from a series of screen savers and specify which audio files will play during system events and error messages. (At the conference, Microsoft used the sound of a window opening as the *Windows* startup sound.) Developers can add their own drivers (called *applets*) to the Multimedia Control Panel for devices not yet supported by *Multimedia Windows.*

Microsoft will also include two new applications with *Multimedia Windows: Multimedia Clock* and *MPlayer. Multimedia Clock* is an alarm clock that can play audio files at a specified time and at hour, half-hour, and quarter-hour intervals. *MPlayer* is a simple multimedia player that can play a variety of multimedia files, including waveform audio, MIDI, animation, and CD audio.

To accommodate the new multimedia files, Microsoft is adding a new file format to *Windows,* called Resource Interchange File Format (RIFF). Strictly speaking, RIFF isn't a file format at all, but a family of formats that includes audio-file formats (WAVE, MIDI, and RMID), image-file formats (DIB, RDIB, WMF, and PAL), a multimedia-movie file format (MMM), and a text-file format (RTF). RIFF files contain a special header that describes the format of the data that makes up the rest of the file so the data will be handled appropriately.

While the minimum configuration for *Multimedia Windows* calls for a standard VGA card, Microsoft is encouraging developers to write applications for Super-VGA cards capable of displaying a resolution of 640 × 480 with 256 colors. For systems with a standard VGA card, Microsoft recommends that users switch to a 16-color gray-scale palette while keeping the 640 × 480 resolution. Most 256-color graphics hold up well when reduced to 16 shades of gray.

Look for *Multimedia Windows* to be released sometime in 1991 (it may even be available by the time you read this). According to Microsoft, *Windows* and *Multimedia Windows* will eventually be merged into a single package.

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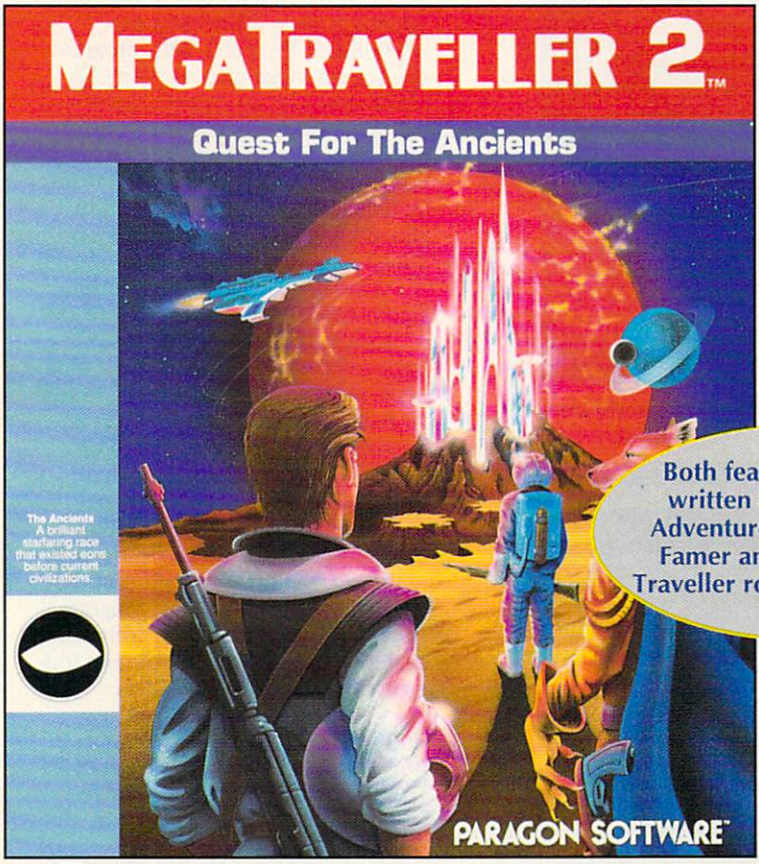
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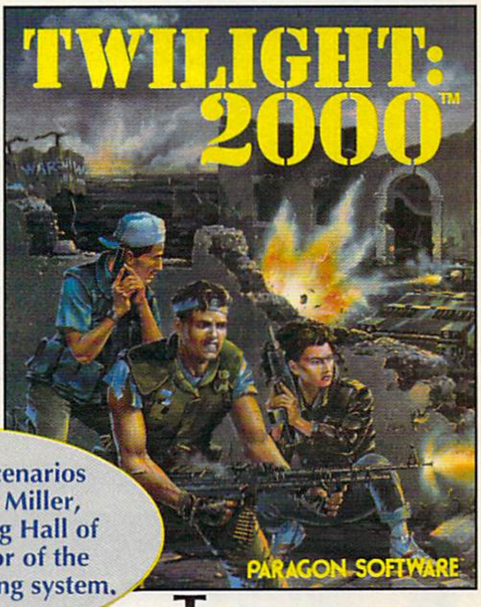

Both featuring scenarios written by Marc Miller, Adventure Gaming Hall of Famer and creator of the Traveller role-playing system.

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- Weapons and starship classes of all kinds; a dazzling array of characters with whom to interact

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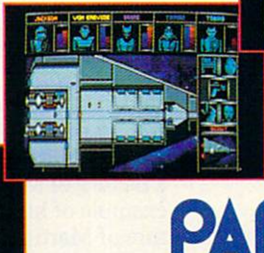

Twilight: 2000 places you in the aftermath of World War III, travelling through terrain devastated by high-tech weaponry and nuclear radiation.

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IBM screens shown.
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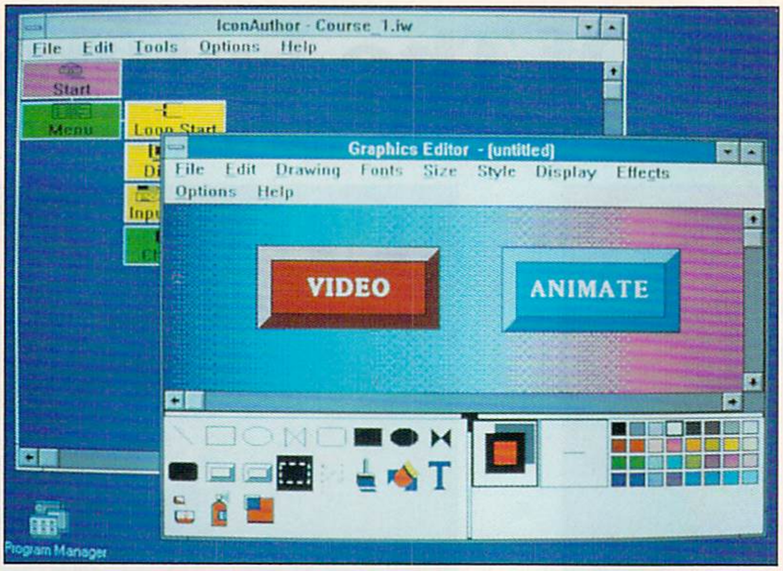
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Menu
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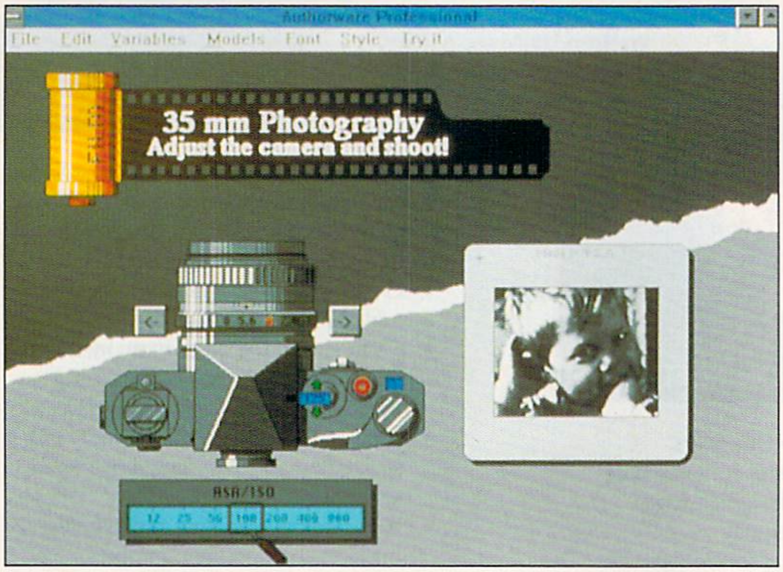
AimTech's *IconAuthor* allows nonprogrammers to create multimedia applications.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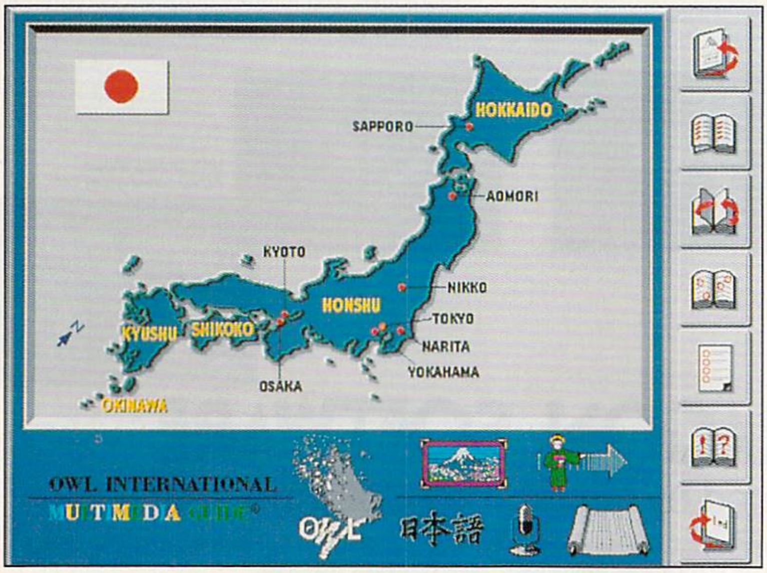
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for fast text searches on CD-ROM. It can also function as an index-and-search engine for other *Windows* programs.

The talking-heads program is still in early development. It was used in the opening presentation of the conference to show off the power of *Multimedia Windows.* This program can stream video directly off a CD-ROM disc with no flicker. In the opening presentation, a man's head appeared in a small window on the computer screen and spoke to the audience. Combined with animation and sound effects, it was truly an impressive sight.

I learned after the presentation that Microsoft had used a PS/1 (a 286 running at 10 MHz) and a Sound Blaster—the minimum required for a *Multimedia Windows* system—to perform the presentation. Eric Ledoux, technical lead for Multimedia Systems Tools at Microsoft, said that even at full screen on a 286 there would be very little flicker. While few individuals can afford the equipment to transfer their own full-motion videos to CD-ROM discs, this program does show the potential for software developers to include full-motion video in their CD-ROM products.

Will It Fly?

Will multimedia succeed on the PC? To answer this question, you have to break the potential audience into several groups. For internal use in corporations and other organizations, where money and standards are less of a problem, multimedia should do well almost immediately. Training presentations and in-store kiosks could use the new animation and sound capabilities to make dry information more entertaining. Corporations will also be attracted to the possibilities of voice-annotated mail. Companies that need CD-ROM discs for a hundred or more sites will find it cost effective to create their own discs. Already you can buy a machine for about $30,000 that can produce CD-ROMs for $50 each.

School systems will also be able to spread their costs over many users. Animation, voice, and a huge database of information will make educational programs more exciting for students. The current version of *Compton's Multimedia Encyclopedia* on CD-ROM points the way: Click on a picture of Mozart, and you hear an example of his music. Click on a picture of Martin Luther King, and you hear the "I have a dream" speech. With the encyclopedia's SmarTrieve search engine, you can ask, "Why is the sky blue? " and receive a list of articles that contain both words, *sky* and *blue.* Look for similar knowledge-

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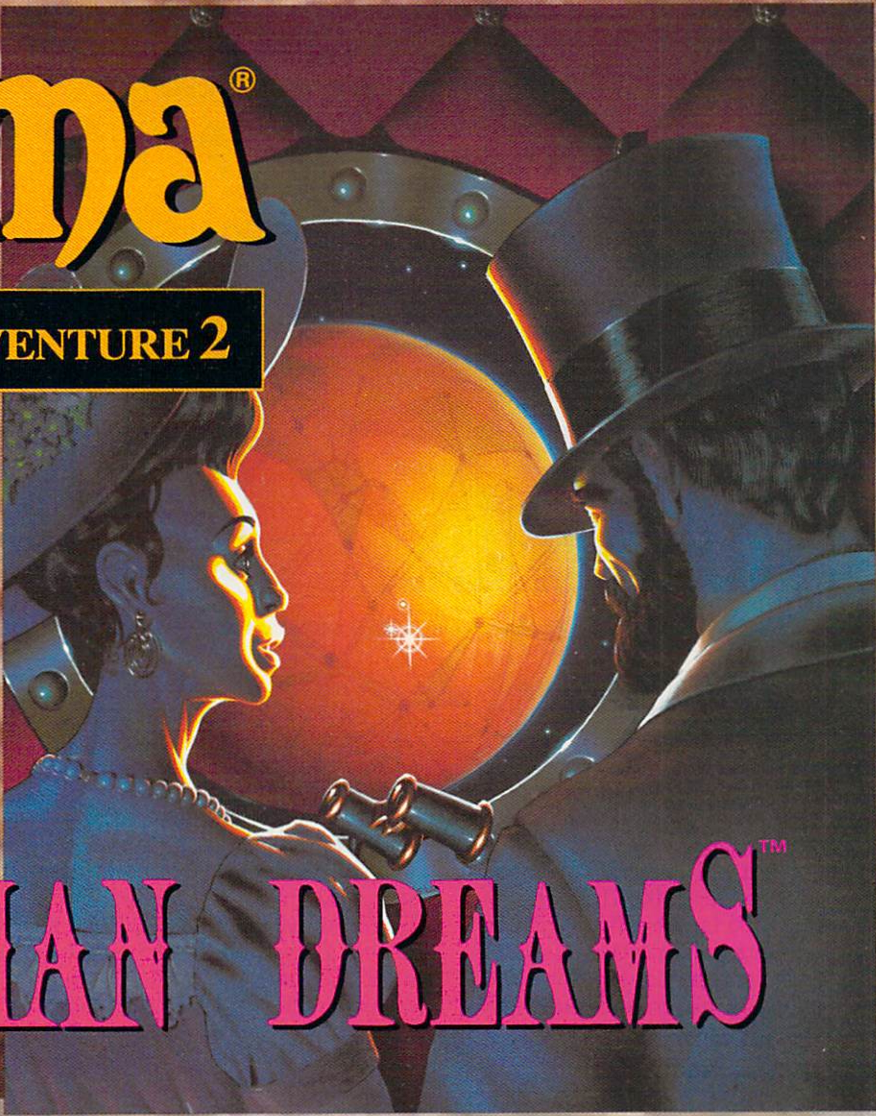

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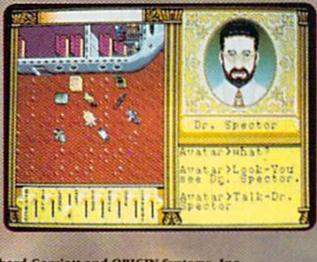

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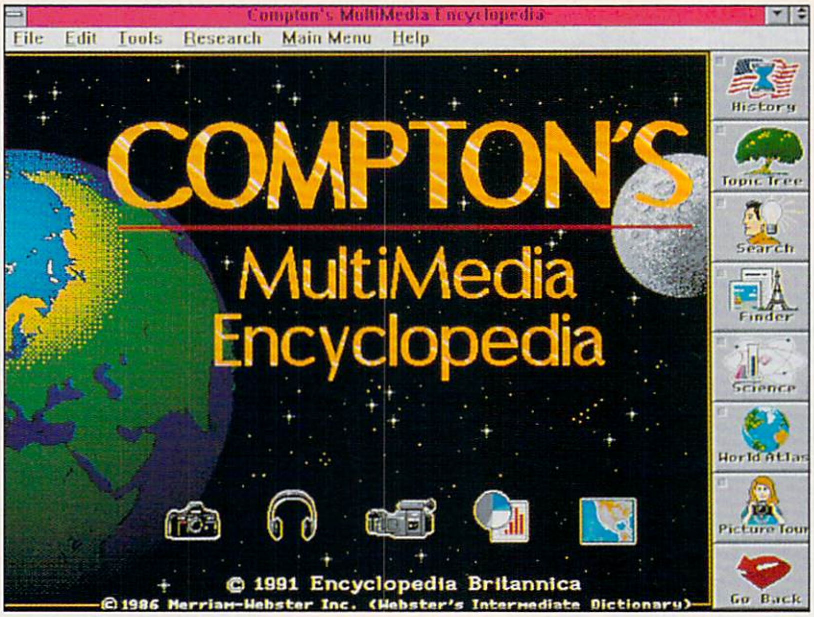
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***Compton's MultiMedia Encyclopedia* includes a sophisticated search engine.**

based CD-ROM products to be released throughout the year.

How about the home market? Gregg Riker, director of development for Microsoft's Multimedia Systems Group, says, "In the long run, it's the home market that we're excited about." But will home-computer users be willing to pay $900–$1,500, plus another $895 for the software, just to run a multimedia encyclopedia? Until there are enough titles and prices fall for CD-ROM players and sound cards, most buyers will take a wait-and-see attitude. Microsoft hopes this conference will get the ball rolling on software and that developers will jump on board early.

What will multimedia software for the home look like? It's too early to know for sure, but CD-ROM titles such as Sierra's *Mixed-Up Mother Goose,* Activision's *the Manhole* and *Cosmic Osmo,* and Britannica Software's *Compton's Multimedia Encyclopedia* indicate that we'll see high-quality graphics, extensive use of spoken voice, and an interface that's easy to use and interactive. Look for recorded-music packages that combine CD-audio tracks with megabytes of background information on CD-ROM, similar to Mozart's *Magic Flute* from Warner Audio Notes and Beethoven's *Ninth Symphony* from The Voyager Company. With *Windows'* ability to stream video from a CD-ROM disc, Max Headroom might even make a comeback.

Even if CD-ROM is slow to catch on in the home market, Microsoft's multimedia specifications have finally set a viable sound-board standard for the PC. Expect more games and applications to support the real-sound capabilities of the Sound Blaster and future *Windows*-compatible sound cards. Adding MIDI support to *Windows* (including a built-in sequencer) will help the growing market for *Windows*-based MIDI software.

While, at this point, it looks as if multimedia on the PC is still a ways off, don't be surprised if it takes hold in a hurry. Once we see $300–$400 CD-ROM players and 20–30 solid titles, multimedia could establish a momentum all its own. Five years from now, we may be talking about the 1990 Microsoft Multimedia Developers Conference as the place where PCs came of age—where static graphics and simple beeps were replaced by full-motion animation and real sounds. I can hardly wait. ⊡

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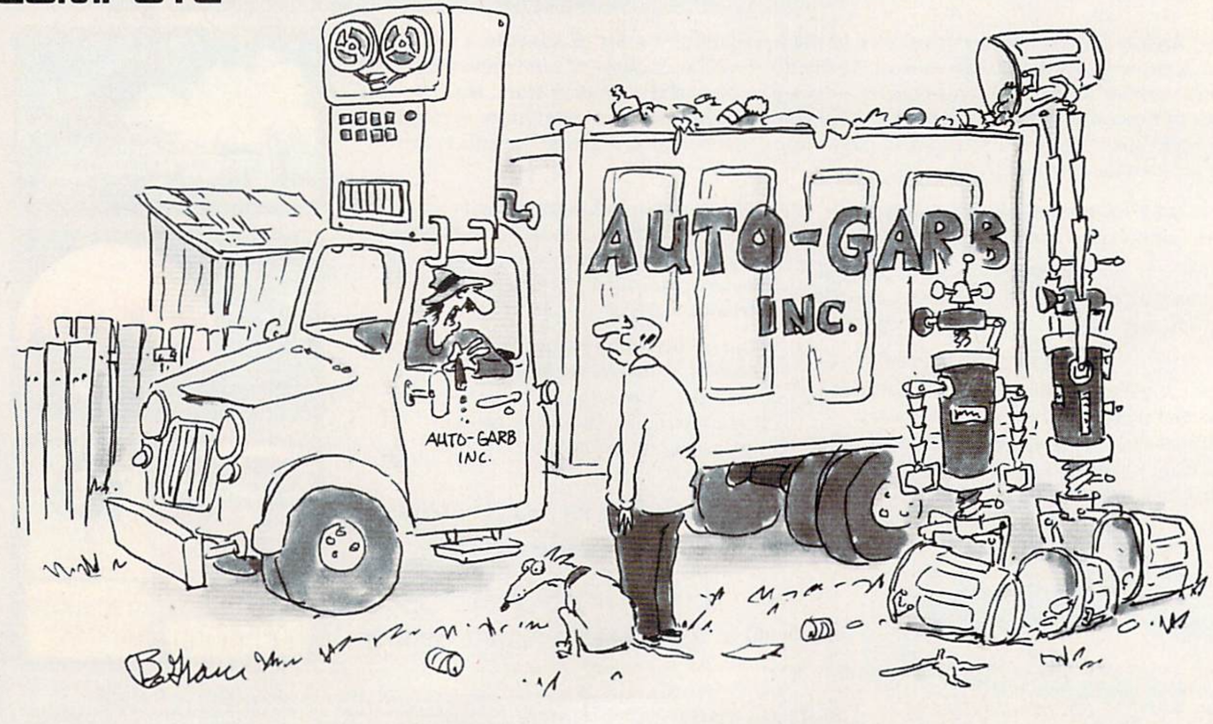
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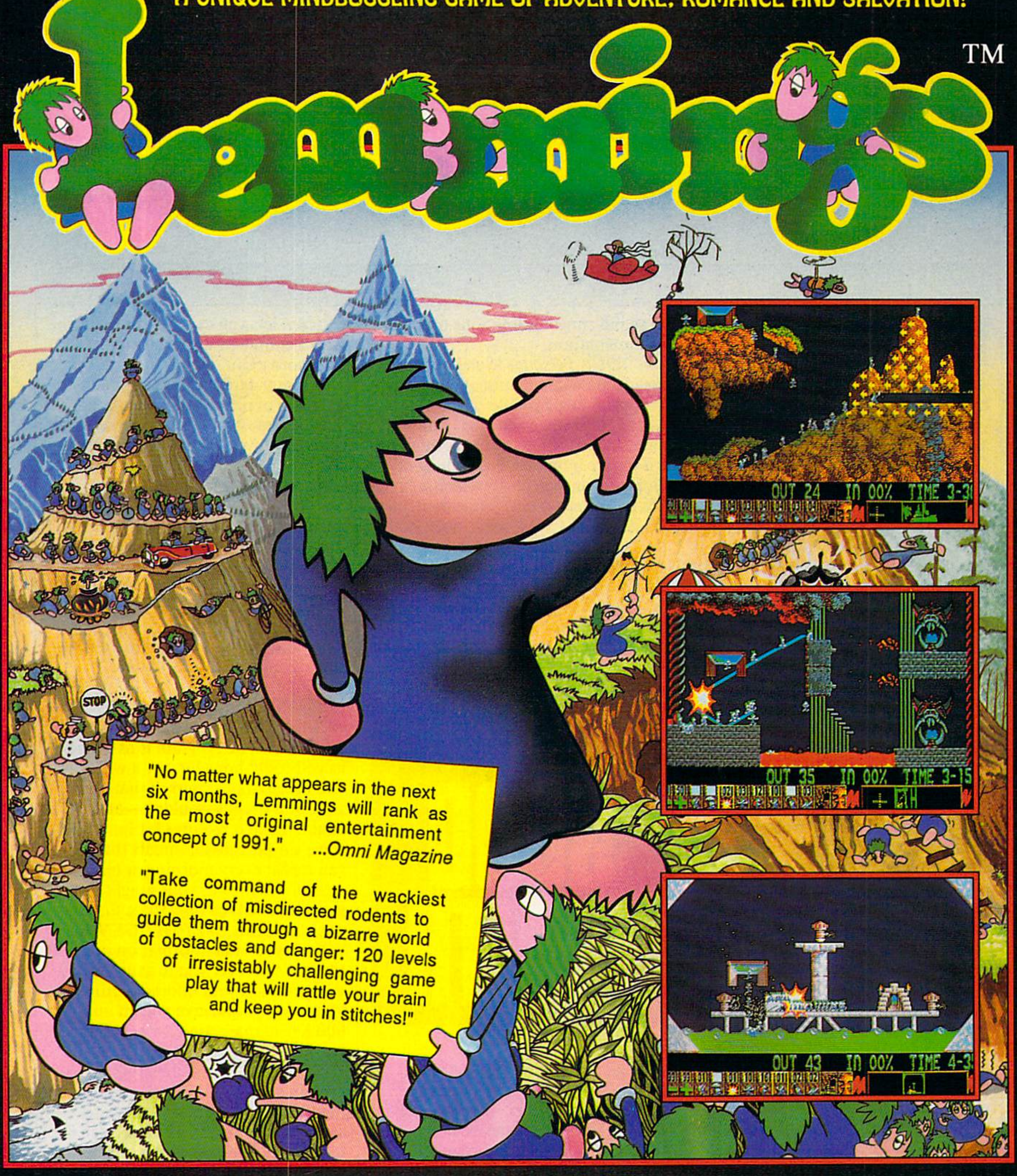

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SHAREPAK

HERE'S TO YOUR GOOD HEALTH

RICHARD C. LEINECKER

You've used your computer to optimize your productivity, educate your family, and fill your leisure hours. Now your computer can be used to improve the quality of your life by helping you cultivate a healthy body.

The first program on this month's *SharePak* is called *YOUR Personal Nutritionist.* It gives you an abundance of information about foods and their nutritional contents. It also helps create comprehensive nutritional plans for you and your family. The second program is called *BioRhythm.* It helps you plan another aspect of personal well-being, namely, the synchronization of your activities with your biorhythm cycles. The last program, *WEIGHT GENIE,* lets you know how successful you've been at losing weight by telling you what your ideal weight is and estimating the level of fat in your body.

Our *SharePak* disk includes the very best shareware that relates to each month's editorial theme. We comb the boards and then spend hours testing programs to ensure that the *SharePak* disk is packed with great programs designed to increase your productivity and improve the enjoyment of your computer time.

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YOUR Personal Nutritionist

Wouldn't you love to stay in perfect health forever? Everyone gets old, but *YOUR Personal Nutritionist* can help you lead a longer and healthier life. It provides information about most foods, plans individual meals, and designs overall nutritional programs and diets. And the program is easy to use. The menus let even novices use the program right away without having to spend time reading tons of documentation.

YOUR Personal Nutritionist is the ultimate in nutritional programs because it helps you do the right thing. That's better than tracking your bad habits after the fact, as many other nutrition programs do. From the food database you can create and store recipes and attach notes. You can preplan healthy meals using individual food items and portions of recipes from the database. The program also lets you create a daily nutritional regimen.

Besides the long-range planning, *YOUR Personal Nutritionist* lets you analyze meals, recipes, daily regimens, or single food items for vitamins, minerals, fat, cholesterol, carbohydrates, calories, fiber, and the essential amino acids. The database of foods is extensive, and you can browse it in several ways. An exercise section helps you estimate your caloric needs.

Diet, health, and fitness are concerns for every family. You'll want to get *YOUR Personal Nutritionist.*

BioRhythm

Plenty of people place great value on synchronizing daily activities with their personal biorhythms. Some research gives credence to the idea that biorhythms actually affect people in more ways than we realize. *BioRhythm* lets you explore this realm with a simple-to-use, easily understood program.

The program collects a small database of personal information. That's because biorhythm patterns are different for just about every person. Birth date and gender are the most important pieces of information.

You can create a chart for one person, or the program will show you a graph for two people. It's very interesting to see how the program rates the compatibility of married couples.

If you register the program, you'll get a version that prints your charts. And with registration comes notification of updates and additions.

WEIGHT GENIE

WEIGHT GENIE is pure simplicity to operate. The program is as friendly as you could hope for, yet it will tell you things about yourself that even your best friends wouldn't—and couldn't. All it requires for input are three simple measurements that you can repeat every morning or once a week for as long as your weight program lasts. Given only these three measurements, *WEIGHT GENIE* will tell you vital information that will make it easier for you to gauge the effectiveness of your efforts to gain or lose weight—and give you an important key to maintaining a healthier body.

Just how easy is the program to use? To start, type GENIE at the command line. Then enter your name, age, sex, and weight. The next step is to enter the measurements of your abdomen, forearm, and buttocks. As soon as *WEIGHT GENIE* has this information, it generates the results. You'll learn instantly what your ideal weight is and how much of your weight is fat.

Bathroom scales, make room. *WEIGHT GENIE* is the next step in the arsenal of weight-maintenance programs. If you're serious about your health, this program will make it that much easier to achieve and maintain your proper weight. ▣

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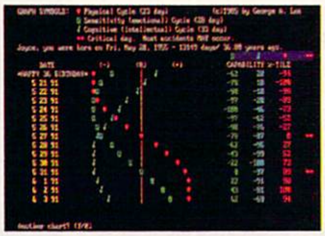
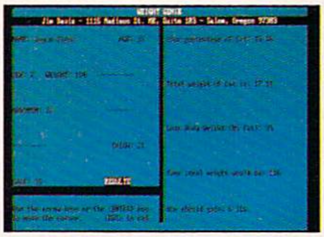


BioRhythm version 2.0



WEIGHT GENIE

YOUR Personal Nutritionist version 3.2.1

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Your imagination can move mountains. Your hands can move worlds. This is not science fiction, but reality. Virtual reality, to be exact.

Virtual reality (VR) is a phrase used to describe a swarm of futuristic technologies with even more futuristic applications. Among the dreams of virtual reality are robots to probe crippled fission reactors; simulcast video conferences convened in identical rooms scattered from Zanzibar to Arkansas; classrooms that can explore the inner workings of thunderstorms, combustion engines, or the nuclear furnace of the sun; and entertainment for millions as they explore worlds that exist only in the computer.

Loosely based on the idea that computers and other hardware can recreate or enhance reality or, better yet, create artificial realities, even the rough-edged forms of VR test the capabilities of powerful computers.

VR's best-known image is a pair of darkened goggles and a black glove. Both are packed with sensors and trail wires to a high-powered computer or workstation.

Through the goggles you can see a computer graphic representation of a room; turn your head, and the graphics update to make it seem as though your head turns in the alternate reality, too. Motion and position sensors in the glove tell the computer to move you through the room when you point your finger, to grab a computer-generated chair when you close your hand. It's crude but a lot of fun.

Virtual reality would be the supreme computer game, for not only would you be able to truly interact with the game, but if the visionaries have their way, you'd be able to write your own script, too, simply by making choices. Imagine playing an Ultima game in which *you* swing the sword and *you* make the decisions about the scope and direction of the game. Left here or straight ahead? Fight or run away? VR would be the ultimate interactive role-playing game.

Virtual reality is, to put it kindly, in its infancy. Even its most fervent proponents believe that years, maybe decades, stand between today's VR and tomorrow's fully realized virtual reality. In the meantime, its advocates hold conferences and seminars to explain what they're doing and argue about where they're going. Cyberthon was one such conference. Sponsored by the Whole Earth Institute, publisher of the *Whole Earth Catalog,* Cyberthon held court in San Francisco last October. The major VR names and faces were there, from Jaron Lanier, creator of the Dataglove, to William Gibson, the science-fiction writer whose novel *Neuromancer* inspired many VR developers and designers.

This is less an account of Cyberthon than a report from the fringes of VR. Put on your goggles, slip on your gloves, and join us for a ride through virtual reality's dreamscape.

The Cyberthon Marathon

Sleep deprivation is the poor man's virtual reality.

Why spend thousands on unproven technology, one-of-a-kind graphics boards, and sensory-stimulation goggles and gloves when you can get the same results—an illusion of alternate realities—by going without sleep for 30 hours or so?

Scheduled as a 24-hour, round-the-clock conference, Cyberthon waxed and waned along with the attention spans of its attendees. Early in the day, crowds pressed through a rat's maze of wooden corridors, black curtains, and small, hot spaces. By late evening, many had seen enough and deserted the warehouse district for a good night's sleep. Two o'clock rolled around, and the desperate stood in line to lie in the La-Z-Boy of the future with goggles masking reality in the Sense8 exhibit. And every hour, on the hour, zombies straggled out to check the lottery boards to see if they'd struck it lucky and won a session with what little hands-on virtual reality hardware was around.

Conversation, always strange at computer conferences and stranger at this one, where practitioners haven't even decided what it is they're doing, became even more bizarre around 5:30 a.m. Question-and-answer sessions trailed off as people forgot what they were driving at, while some people simply nodded off in the front row. "Check out the airplane," said one conferee, talking about an airliner reproduction tucked into a corner. No, not because it was interesting, he said, but because the seats were cushy and you could lean back and nap.

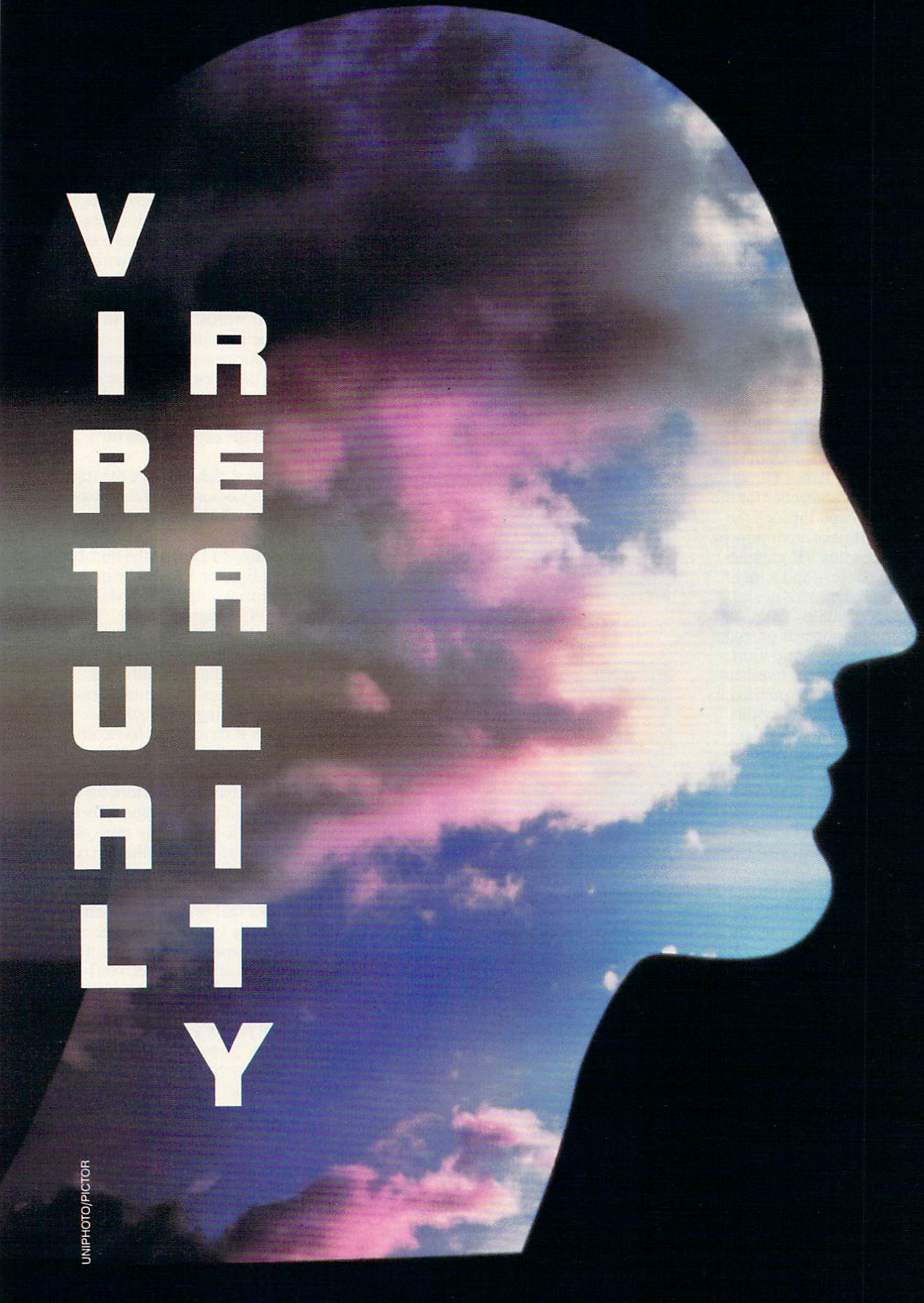
Cyberthon's flavor was pure Woodstock, the celebration of something new and exciting. I haven't seen so many tie-dyed shirts since high school 20 years ago. But the enthusiasm, the idealism, the naiveté were infectious.

Similarities to the opening days of personal computers are too strong to dismiss. A hot, new technology that showed great promise, struggling along on the dreams and sweat of young developers and engineers who string garlic around their necks at the first sign of a pinstriped suit. People worried about good and evil applications and hoped for the democratization of the technology—and wondered what that would do to ordinary folk.

I'll be following virtual reality as long as it hangs in there. That fascination is what the Cyberthon marathon left me with, even after I'd caught up on my sleep. ▹

GREGG KEIZER

VIRTUAL REALITY



UNIPHOTO/PICTOR

Hardware Makes It All So Unreal

The heart beating in virtual reality is a computer. And those computers are a lot more powerful than the 286 system you've got in the den or home office.

Sense8 was one of two companies to bring full goggles-and-gloves VR rigs to the Cyberthon site. With its software running on a Sun SPARCstation (a high-end workstation that runs in the $8,000–$10,000 range), Sense8 put its VR viewers at ease by seating them in a Flogiston chair, a recliner that looks as if it escaped from George Jetson's living room.

Traditional VR goggles over the eyes and a modified Mattel Power Glove on one hand completed the gear (the Power Glove is a player controller developed for Nintendo videogames and is a direct descendant of the Data Glove, the glovelike sensing device used in many virtual reality setups). The SPARCstation generated the graphics, then pumped them to the goggles, while the Power Glove (and a softball-sized controller for the other hand) guided you through the computer-made artificial environment.

Not only does this VR graphic processing take power—and a lot of it—but the rigs are temperamental. You can't expect reliability from handcrafted graphics boards or snake dens of cables. One VR setup went down for the count when it overheated; another's blank goggles puzzled its operators until they noticed a cable had been kicked loose.

More Cyberthon hardware explored other worlds of virtual reality. A flying mouse let users point and click their way through 3-D animations (raise the mouse off the desk, and it sends the pointer into 3-D mode). Other devices gave tactile feedback on your fingertips (virtual pain?) or a stereoscopic view of remote television cameras through a binocularlike boom contraption. And in one room, you could watch yourself play with a prerecorded band as an Amiga 2000 (packed with three proprietary graphics boards and connected to video and MIDI equipment) overlaid a live shot of you with a taped music video. The Mandala Virtual World System runs a paltry $19,600, a mere pittance in the unreal costs of virtual reality.

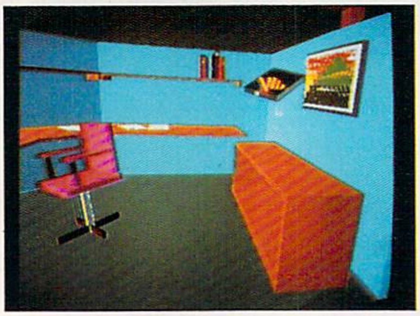
Computers make virtual reality possible. But don't expect the technology to drop into your family room or to be the price of a Nintendo any time soon. As Jaron Lanier, creator of the Data Glove and head of VPL (the company many consider the leader in VR), said at Cyberthon, "Everyone wants to take virtual reality home, but even I can't afford it."

The View Through the Goggles

Though there were nearly three dozen exhibits at Cyberthon, the ones that mattered were the three goggles-and-gloves demonstrations by VPL, Sense8, and Autodesk. Because of the limited amount of gear, Cyberthon held hourly lotteries whose winners sampled virtual reality firsthand.

I got behind the Sense8 equipment nearly 18 hours into Cyberthon. For ten minutes I walked through a landscape created by a computer.

Look through the goggles, and you get a glimpse of the Sense8 virtual reality as generated by a Sun SPARCstation. All angles and bright colors, the room you see looks like an office cubicle, complete with shelves and chair. By alternately moving the hand encased in the hot-wired Power Glove and pressing on a small control ball with the other, you "move" around and outside the room. (Actually, you stay flat on your back in a formfitting space-age recliner while the computer changes the sights sent to the goggles.)



The virtual office: Some VR sports a cartoonlike appearance.

The glove and goggles make it possible.

It's easy to move about, but not so easy to do anything even mildly coordinated, like grabbing that pesky chair and putting it on the countertop. But you can do some amazing things, like floating above the room for a bird's-eye view or even sinking through the floor to "swim" beneath the room and emerge under a desk.

You find yourself tilting your head back to look up in the computer-constructed playroom, slowly twisting your neck to look around. As sights shift before your eyes, the feeling is both mundane and magical. You get used to it all so quickly. Maybe there's something to VR, you think. Maybe all the mystical talk about the technology and how it will change communication, play, and work isn't so mystical after all. That's when you know you're hooked on VR.

Sharing of the Imagination

"What I'm worried about is that everyone will get bored waiting," said Lanier.

His comments were echoed by several virtual reality practitioners and developers. They're afraid that expectations have already outstripped their ability to deliver workable (much less affordable) virtual reality.

In other words, it's going to be a long time before virtual reality entertains and educates us in the home or helps us in the workplace or the laboratory. Stuart Brand, author of *The Media Lab,* said, "It'll take ten years to live up to the expectations of today."

If Brand is right and it's the turn of the century before the technology is viable, what will VR be? That depends on whom you talk to.

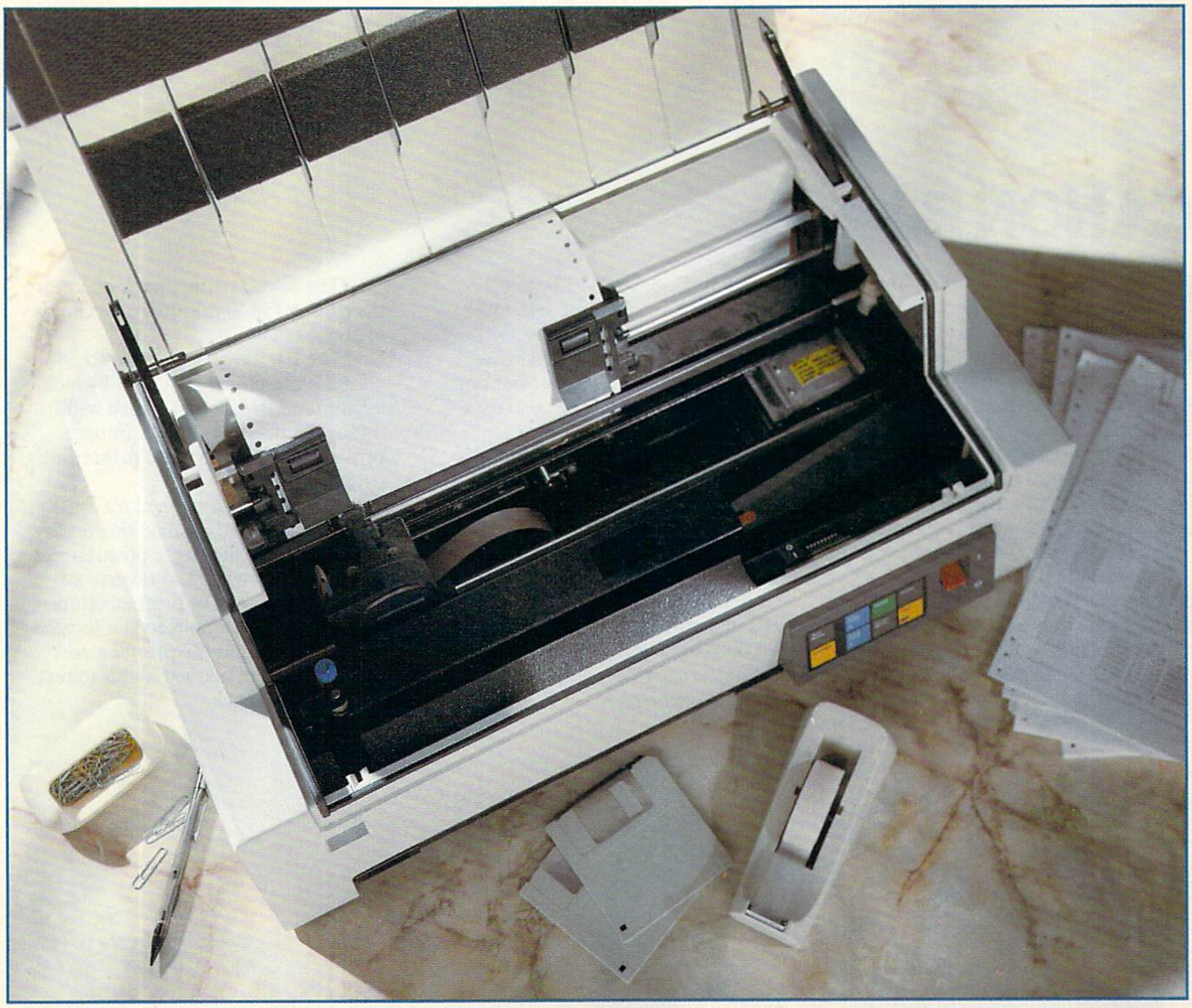
According to Lanier, the number one application for VR will be in design and prototyping. Autodesk, famous for its PC design program *AutoCAD,* obviously agrees. Autodesk is hot on the VR development trail. Other uses, said Lanier, will be as complex interfaces for communication and in training applications.

Other VR developers have other ideas. Larry Leifer of Stanford University and Tolfa Corporation envisions VR as a tremendous tool for the physically handicapped, especially as some of the VR technology spins off and is put to use in rehabilitation robotics, intelligent machines to help the handicapped. "Virtual reality is a model of the real world," said Leifer as he showed a video of a robotic arm that fetched paper, ran a printer, and did more—all at a paralyzed computer analyst's spoken commands.

Brenda Laurel of Telepresence sees virtual reality's entertainment possibilities. "It reminds me of the way things started in the computer game business," she said. "Games began with engineers doing cool things. They designed games for themselves."

Virtual reality's entertainment opportunities shouldn't be limited so quickly, and they shouldn't duplicate computer games, Laurel said. Instead, she said that virtual reality's practitioners must ask, "What do we really want this for?"

Maybe all we want is what Lanier wants. "Virtual reality is the media for the sharing of imagination. Not a sharing of the physical world." ⊡



MARK WAGONER © 1991

Each month *COMPUTE's* Test Lab focuses on a specific kind of hardware and offers you the information you need to guide your understanding of the technology and to make informed buying decisions. Our comprehensive system benchmarks are accompanied by in-depth explanations of the tests and the technology. Attractive graphics clarify differences in features and performance. You also get the expert product reviews that PC activists have come to expect from *COMPUTE*. This month, Test Lab examines four dot-matrix printers, two bubble-jet printers, and three laser printers. So whether you need to print out a recipe or a dazzling desktop-published business report, read on. These printers can handle just about any print job you have.

Canon BJ-10e
Canon BJ-330
Fujitsu DL4600
NEC Pinwriter P6200
Qume CrystalPrint Express
Qume CrystalPrint Publisher II
The Printer Works JetScript-CX
Star Micronics NX-1020 Rainbow
Star Micronics NX-2420 Multi-Font

CANON BJ-10E

Compact, light, and quiet—the Canon BJ-10e printer offers IBM ProPrinter X24E emulation and quality output.

The easy-to-use Bubble Jet parallel printer is more like a sophisticated dot-matrix than a low-end laser printer. While not particularly rugged, weighing four pounds and sized 12.2 × 8.5 × 1.9 inches, the BJ-10e could be used, with care, as a portable printer.

In both High Quality and Economy modes, the BJ-10e operates at 83 characters per second (cps). The darker HQ mode uses a 36 × 48 dot-matrix; Economy mode uses a highly readable 18 × 48 dot-matrix. Text characters include proportionally spaced 5-, 6-, 8.5-, 10-, 12-, and 17-character-per-inch fonts, selectable from the control panel or by software control. You get bold, underlined, subscript, and superscript—but not italic—styles. The BJ-10e also uses downloadable fonts.

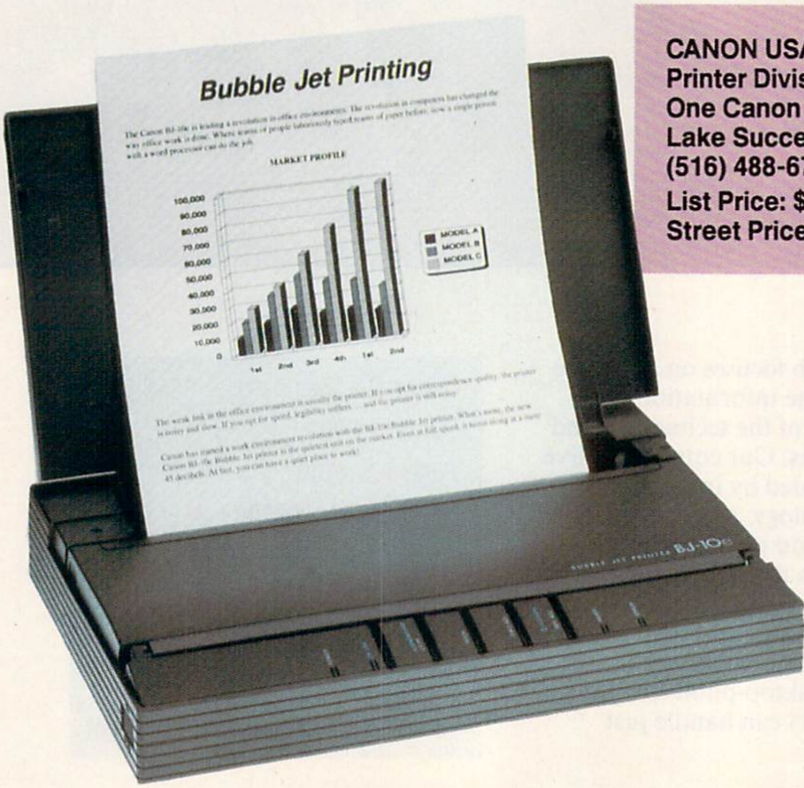
The Bubble Jet printer can produce graphics using 8-, 24-, or 48-dot formats and offers resolutions of 60, 120, 240, or 360 dots per inch, depending on which printer drivers your software provides.

Easily replaceable, the Bubble Jet's ink/printhead cartridge lasts for 700,000 characters. The printhead is part of the cartridge, reducing printhead wear problems.

The ni-cad battery pack operates the printer for 40 minutes on a charge of about ten hours.

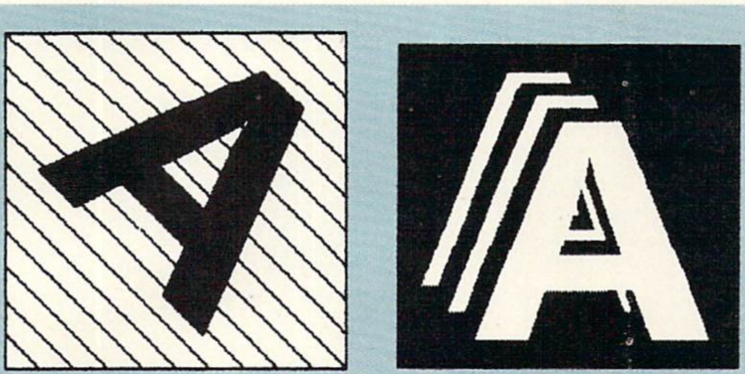
The BJ-10e prints on 14- to 24-pound plain paper, in 7.2- to 14-inch lengths and in 7.2- to 8.5-inch widths. (Since the BJ-10e is not an impact printer, you can't use it to print multipart forms.)

A highly accurate feed mechanism makes feeding single sheets easy. You can adjust the paper position vertically with forward and reverse adjustment buttons. To print envelopes, just use the envelope-feed slot located in the bottom and the printer stand that folds out to allow the unit to rest upright on its back.



CANON USA
Printer Division
One Canon Plaza
Lake Success, NY 11042
(516) 488-6700
List Price: $499
Street Price: $332*

*Test Lab street prices are an average of prices advertised in computer magazines and national newspapers during March 1991.



This *GEM Artline* sample illustrates output quality.

The Canon ASF-6410 Auto Sheet Feeder is a useful option, but it holds only 30 sheets of letter, A4, or B5 paper. The printer stands vertically, and the sheet feeder attaches to feed paper through the envelope-feed slot. You can also manually feed paper with the sheet feeder attached.

A special DIP switch tells the printer whether you're using the sheet feeder. You'll find all the printer's DIP switches within easy reach and labeled with abbreviated descriptions.

You'll pay $90 for the ASF 6410 sheet feeder, $50 for a ni-cad battery, $25 for each cartridge, and $35 for a replacement AC adapter.

The manuals for the printer and sheet feeder are brief but thorough, with plenty of drawings to guide you. Unless you plan to design your own fonts or control the printer's graphics features through programming, you probably won't need the optional programmer's manual. ▹

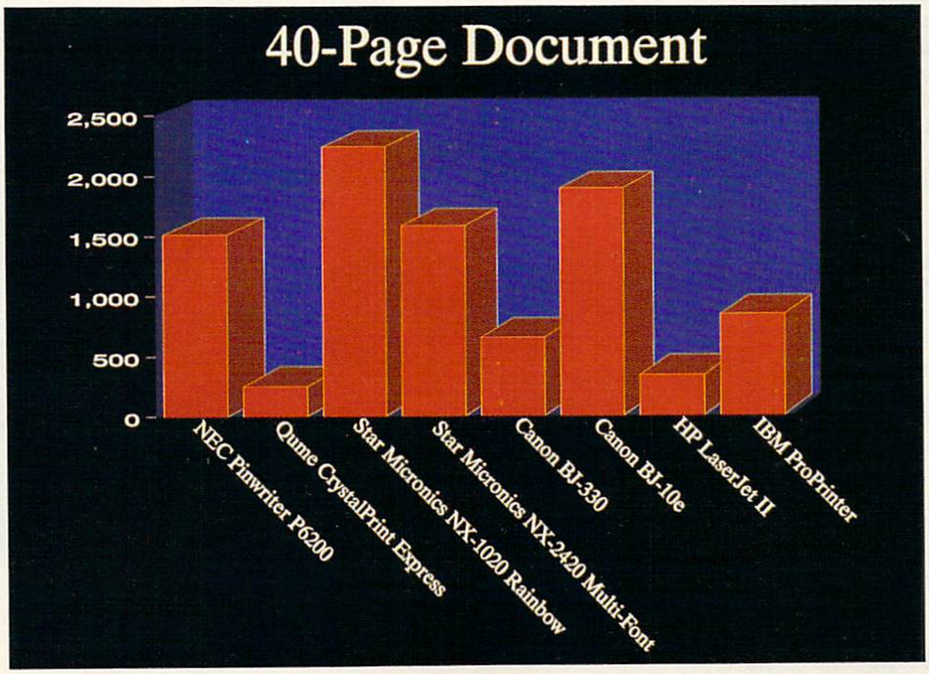
J. BLAKE LAMBERT

What the Benchmarks Mean

Speed continues to play a significant role in everyday computing and printing. Nobody wants to waste time waiting for printouts, so our printer benchmark tests measure how long a particular printer takes to produce output from an everyday application, the kind you might use in your home or office.

Our tests are all timed, so as you compare the results of these tests, keep in mind that the lower the numbers (or the lower the bar in the graph), the faster the printer performed. Setup times are represented in minutes; other time figures are in seconds. The quality of output, a separate issue altogether, can be compared using the output samples that you'll find elsewhere in this section.

- 40-page text document
- 4-page *GEM Artline* graphic output
- 2-page *GEM* desktop published newsletter
- 80K Lotus spreadsheet
- 2 *PerFORM* ruled forms
- Installation time



CANON BJ-330

There's an entire cottage industry devoted to creating huge, heavy, sound-dampening enclosures for high-speed wide-carriage printers. Most of these heavy, bulky printers can be heard in the office on the other end of the hall and shake the entire desk, if not the room.

Now there's a light, fast, and quiet alternative. Canon's BJ-330 uses bubble-jet technology to provide fast, crisp, clean wide-carriage output without the need for earplugs, enclosures, or a reinforced desktop. In fact, the only sounds you'll hear from the Canon are the printhead moving back and forth and the paper being fed through the printer.

Instead of striking a fabric ribbon with a set of pins or burning toner onto a page with a laser, the Canon printer fires ink droplets at the paper from thin nozzles. The term *bubble jet* comes from the process used to spray the ink. When ink in the thin nozzles of the printhead is heated rapidly, tiny bubbles are produced. As the bubbles expand, ink is ejected from the nozzle.

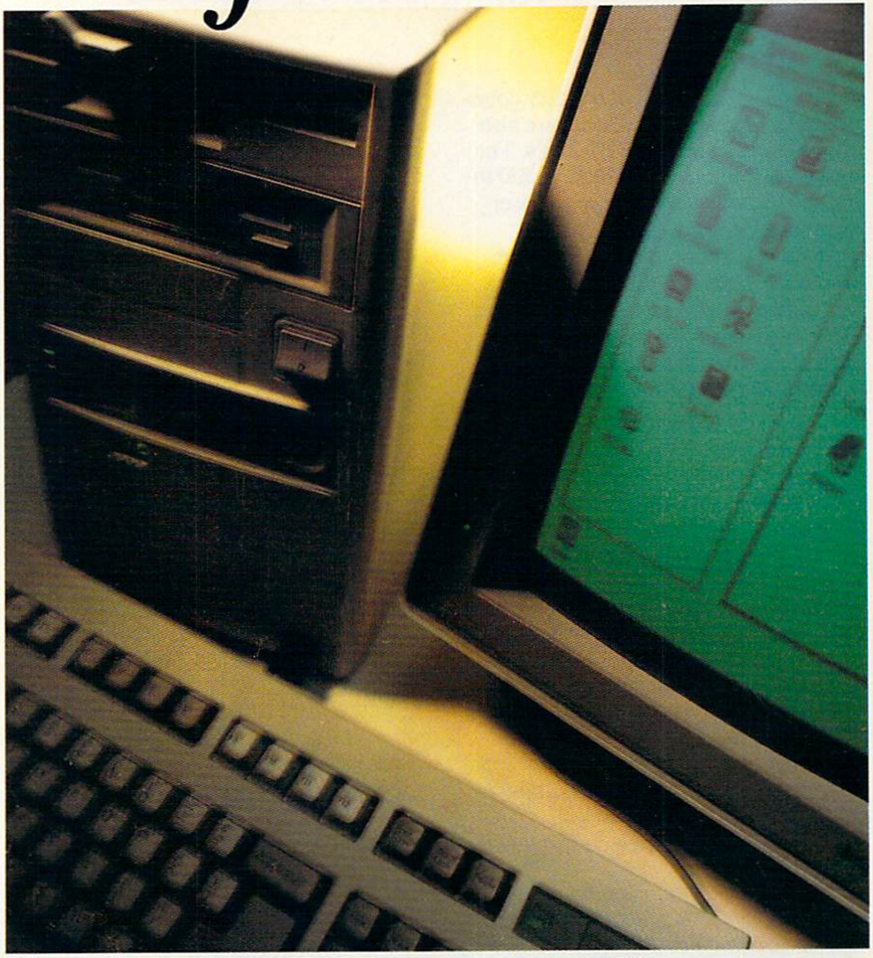
Early ink-jet printers, such as the original Hewlett-Packard DeskJet, used a water-soluble ink that would smear if any liquid touched the page. The Canon's ink is waterproof (as is HP's new DeskJet ink) and prints on standard fanfold, letterhead, or copier paper. You don't have to use the hard-to-find and expensive ink-jet paper required by earlier printers.

While the Canon uses an ink-jet technology similar to that of the HP DeskJet, which emulated an HP laser printer, the Canon emulates a dot-matrix printer (either the Epson LQ-1050 or IBM ProPrinter XL24). Because of this, the Canon's graphics output is only a little better than the dot-matrix output of printers it emulates. HP's similar offering, on the other hand, provides graphics output

CANON USA
Printer Division
One Canon Plaza
Lake Success, NY 11042
(516) 488-6700
List Price: $949
Street Price: $641

Canon
BJ-330

Performance!



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nearly as good as that of its laser counterparts. The DeskJet's fonts are also more laserlike than the BJ-330's. The newest HP ink jet, the DeskJet 500 includes scalable Compugraphic laser-printer-style fonts, which can be printed at just about any point size. The Canon's dot-matrix-style fonts are only available in fixed point sizes. Font cards that add new typeface styles and sizes are available for the Canon, however.

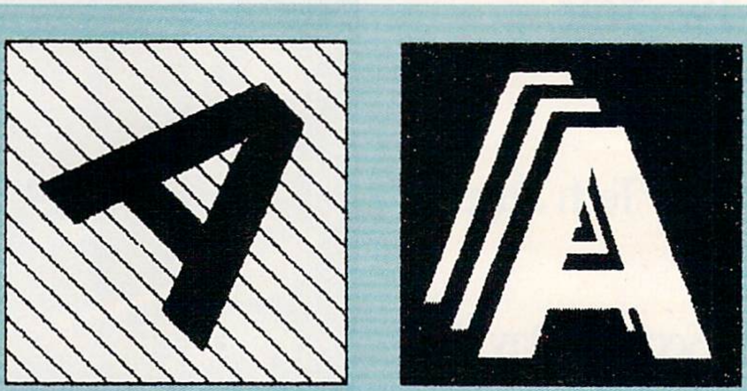
While it doesn't quite match the DeskJet in output quality, the BJ-330 eclipses it in flexibility. The HP printer (and most lasers) will accept only single-sheet letter- and legal-size paper; however, the BJ-330 accepts paper ranging from 3½ to 17 inches in width. The printer handles fanfold and single-sheet paper. A must-have option is the dual-bin sheet feeder. With both bins attached, the printer will automatically feed both plain paper and letterhead, switchable with the press of a front-panel button. Envelopes can be loaded individually or installed in a sheet-feeder bin.

There are three selectable paper paths: top, rear, and front. You don't have to remove the fanfold or sheet-fed paper to run a special form or envelope through the printer; just place it in the front slot.

You set rarely changed options, such as emulation and interface selections, using a set of DIP switches on the back of the printer. Fonts, paper bin selection, print quality, and other options can be easily modified using a number of easily accessible front-panel switches.

This printer is a great example of doing it right—after a month of heavy use, I have no complaints. If you need a fast, quiet printer with flexible paper handling and don't need to print multipart forms, fire up a Canon BJ-330.

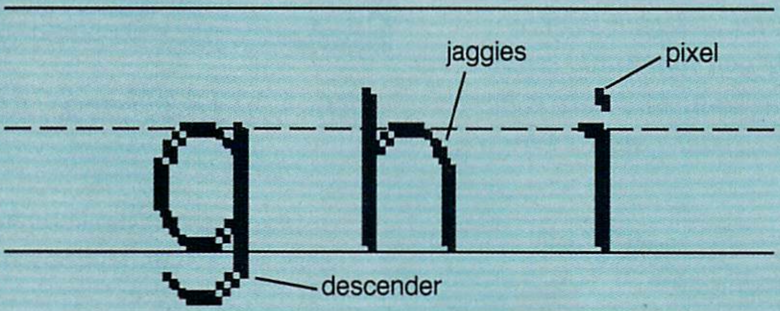
DENNY ATKIN



This *GEM Artline* sample illustrates output quality.

Descenders, Pixels, and Jaggies

Since the early days of computing, certain nightmarish apparitions have haunted computer printouts. One is the descender. Early computer printers were unable to hang the lower part of a lowercase *g*, *j*, *p*, *q*, or *y*. Instead, the entire lowercase letter was elevated to fit within the seven or eight pins used to print the bodies and ascenders of other letters. This made a computer printout look terrible and could even be confusing because there was little or no difference between an upper- and a lowercase *p*. Fortunately, this problem was solved to some extent by the appearance of 9-pin printers and eliminated entirely with the advent of the 24-pin printer.



Graphics resolution has also long been a problem. To begin with, printers often took the graphic directly from the computer screen, transferring it pixel by pixel to the page in the form of ink dots. With the 72-dots-per-inch resolution found on most computer screens, that made for a very blocky drawing. Even when paint programs were supplanted by draw programs, which could send higher-resolution graphics to the printer, the problem caused by lower printer resolution remained.

The term *jaggies* refers to the saw-blade (or stairstep) appearance of slanted or curved lines. Jaggies occur because you are trying to print a line that is not perfectly straight and perfectly horizontal or perfectly vertical—the only kind of line a raster device can create. All printers except daisy wheel printers and plotters are actually raster devices, which must approximate curves by carefully placing assemblages of straight lines. You don't notice the jaggies so much with a laser printer (and even less with a typesetter) because the raster lines are much finer than the raster lines of a dot-matrix printer or your monitor.

As laser printers achieve ever higher resolutions and employ tricks like the Hewlett-Packard LaserJet III's variably sized dots, jaggies will become tamer creatures that may one day disappear from computer printing.

—ROBERT BIXBY

FUJITSU DL4600

As soon as you lift the Fujitsu DL4600 from its shipping box, you'll realize it must be a sturdy printer—it weighs 40 pounds. With dimensions of 7.5 × 22.9 × 15.2 inches, this wide-carriage workhorse isn't a good choice for the cramped home office. But if you need a heavy-duty, high-performance, high-volume dot-matrix printer and you've got the room and a sturdy printer stand, the Fujitsu may be for you.

The large size of this 24-pin printer allows it to use paper up to 16.5 inches wide, so it's a good choice if you're printing ultrawide spreadsheets or proofing tabloid-sized desktop-published documents. The DL4600 is also worth looking at if you need to do rough proofs of pages that will eventually be color-separated or printed on a color ink jet.

While it's true that newer printer technologies will generally provide faster, quieter, and higher-quality output, good old tractor-fed impact dot-matrix printers still offer some advantages. First and foremost is paper handling. The DL4600 will accept friction-fed single sheets and standard tractor-fed paper, and it has an optional cut-sheet feeder. If you need to print a long database listing on one strip of tractor-fed paper, a laser printer won't do. Also, only impact printers will allow you to use carbon forms to print multiple copies simultaneously—the Fujitsu supports one original and up to four copies.

When you run out of ink or toner in an ink-jet or laser printer, you're stuck. With the traditional fabric-ribbon technology used by the Fujitsu, the print gradually begins to fade. If you're printing archival records or other non-quality-sensitive documents, you can use an old cloth ribbon, extending its useful life. Cost per page is less than with newer printer technologies.

While not quite up to the standards of laser and ink-jet output, the

FUJITSU AMERICA
3055 Orchard Dr.
San Jose, CA 95134-2022
(408) 432-1300
List Price: $1,395
Street Price: $1,001

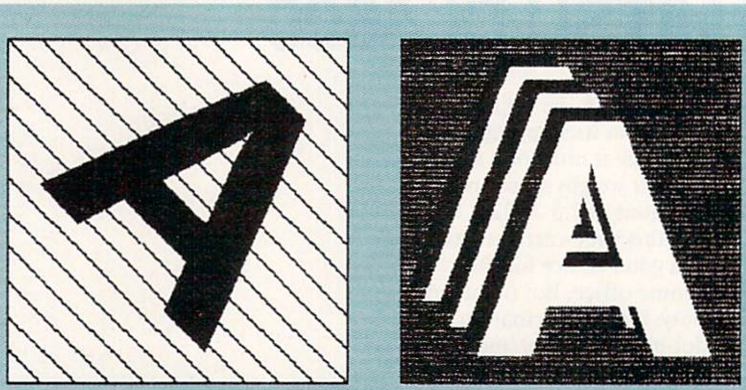
DL4600's output is about as good as you can get with dot-matrix technology. The printer's four built-in letter-quality fonts are very cleanly formed and display no dottiness. Correspondence- and draft-quality fonts aren't as crisp, but they're still very readable. You can also plug in optional font cards to add typefaces such as Orator, Scientific, and Swiss. Fujitsu also sells a program that allows you to use PostScript-style fonts with the printer. Graphics output is good, with up to 360 × 360 dots-per-inch resolution.

The DL4600's four-color ribbon produces eight pure colors for text. Printer drivers included with *Windows* 3.0, AmigaDOS, and many paint and desktop publishing programs will dither those colors to produce thousands of apparent shades. Color output looks washed out when compared to that of ink-jet and thermal transfer printers—the ribbon technology doesn't allow for much saturation. However, the cost per page is much less than with those technologies.

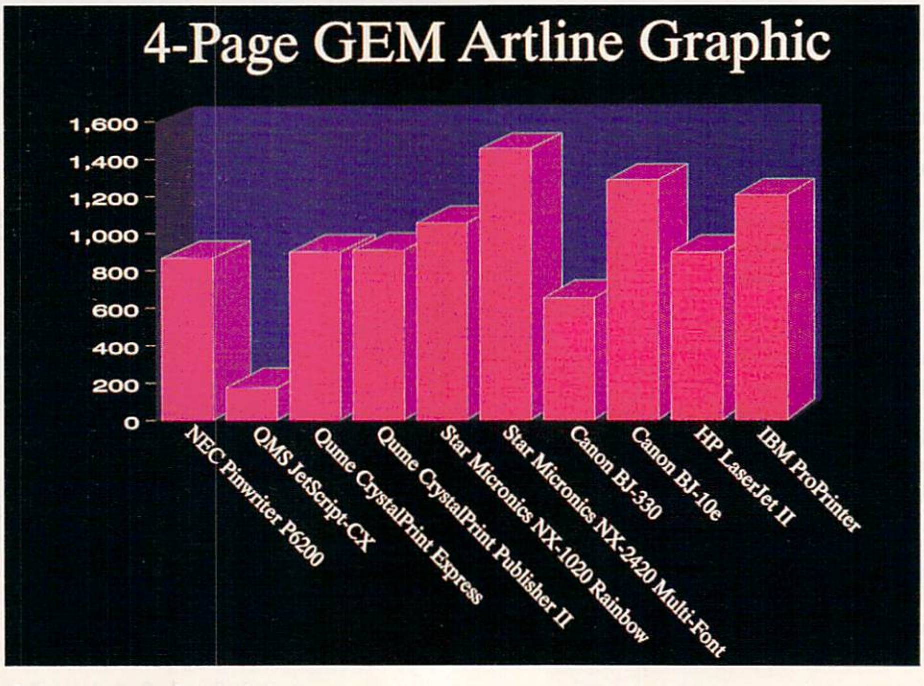
The printer uses the Fujitsu-specific DPL24C command set, which includes most Epson LQ and IBM ProPrinter commands. I had no compatibility problems using Epson LQ drivers with *GeoWorks Ensemble* and AmigaDOS. Change printer settings with touch-sensitive buttons and the LCD display on the front of the printer—there are no DIP switches to set.

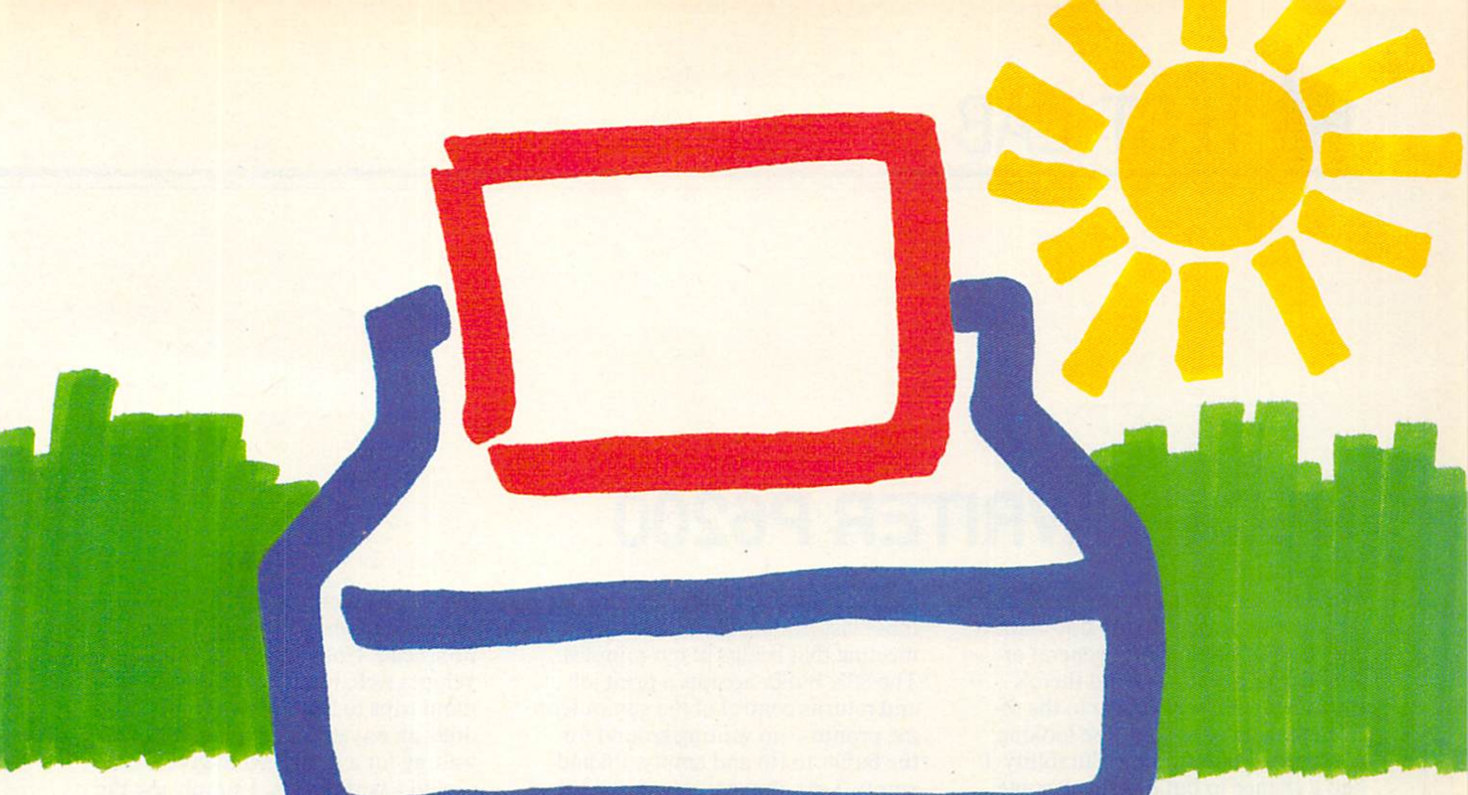
The only problem in six months of using the DL4600 was jammed paper. Tractor-fed paper kept moving off the track and eventually would snag. I ended up using the single-sheet autoloading feature, which worked flawlessly. The jams might cause buyers to hesitate when making a final decision about what printer they want in their home offices. But for overall good performance in a heavy-duty color dot-matrix printer, the Fujitsu is still very much a contender. ▹

DENNY ATKIN



This *GEM Artline* sample illustrates output quality.





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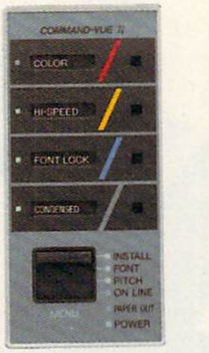
You'll find out that Citizen's 200GX color printer is so easy to use, it'll bring back your best childhood memories.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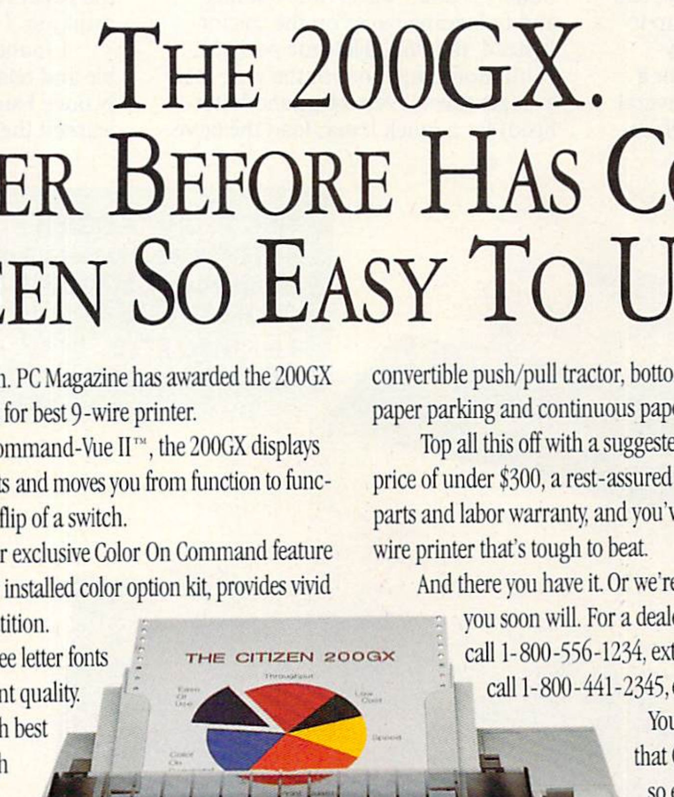
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Circle Reader Service Number 140

NEC PINWRITER P6200

NEC markets the Pinwriter P6200 as a midrange 24-pin dot-matrix printer intended for general office applications. And there's much here that will appeal to the office manager or anyone else looking for speed, flexibility, and durability. I had a chance to put it through some grueling paces, and I've found a lot to like in the Pinwriter P6200.

As dot-matrix printers go, this one is fast—300 characters per second (cps) in high-speed draft mode, up to 100 cps in standard letter-quality mode. I dislike waiting around for a printout, and the P6200 offers several features to help speed me through assignment letters, memos, reports, and those last-minute handouts for the meeting that begins in ten minutes. The 80K buffer accepts a print job and returns control of the computer to me pronto—no waiting around for the buffer to fill and empty, fill and empty. I can move to my next editing job while the last one is printing out.

If I suddenly need to switch from continuous paper to the company stationery, I don't waste time loading and unloading paper on the tractor. Instead, the P6200 lets me park the continuous paper out of the way, load a single sheet (even 24-pound letterhead) for a quick letter, load the envelope for a quick address, and move the continuous paper back to the printhead. Not all printers handle envelopes well, but this one does—no more trips to the typewriter just to address an envelope. And instead of waiting for a form feed to give me access to a perforation, I simply use the Tear Paper button on the control panel, which advances the paper just to the perforation. Eight seconds later, the paper retracts, ready for the next print job. I save time and paper.

I found the control panel accessible and relatively easy to use effectively once I studied the manual and learned the multiple uses of some of

NEC TECHNOLOGIES
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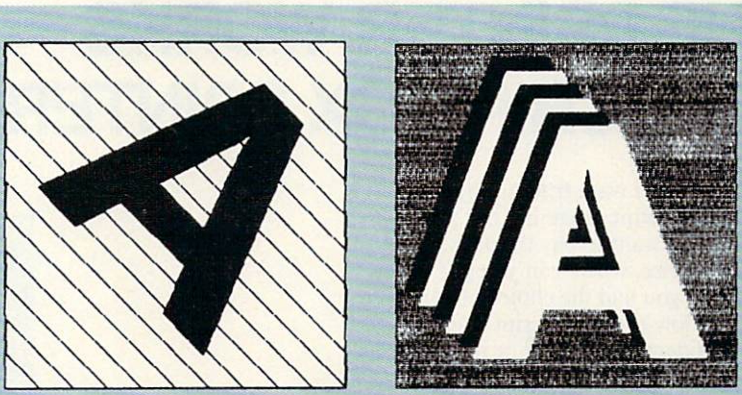
(800) 632-4636
List Price: $749
Street Price: $457

NEC
PINWRITER P6200

the buttons. The manual, fortunately, provides excellent explanations, plenty of illustrations, and a host of cross references. For the less mechanically inclined, actual photographs, rather than illustrations, might have better clarified and simplified setup and other procedures. The index, too, might have been more comprehensive. I looked unsuccessfully there for *emulation* and *specifications.* The manual does, however, provide a glossary, troubleshooting tips, and extensive information on just about any other printer topic relevant to this particular unit. Use the excellent table of contents, and you'll find all kinds of emulation information. There's also a quick reference guide.



This *GEM Artline* sample illustrates output quality.

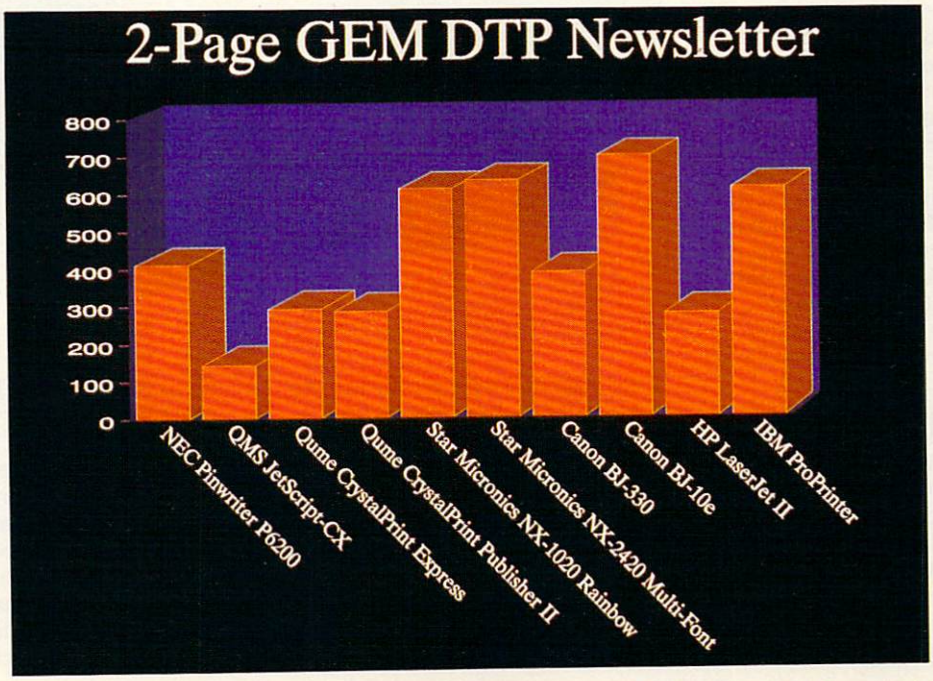
Eight resident type fonts and variations give you lots of options so long as you can find the right driver. You get Draft Gothic, NEC's speedy proprietary LQ Quick Gothic, LQ Courier, LQ Prestige Elite, LQ ITC Souvenir, LQ Bold (proportional spacing), LQ Times (proportional spacing), and LQ Helvetica (proportional spacing). For all nonproportional fonts, 10-, 12-, 15-, 17-, and 20-pitch type is available. If eight fonts aren't enough for you, the P6200 will take several optional font cards.

You must pay extra for IBM X24E/SL24E emulation, a serial interface, the color printing kit, the pull tractor (required for bottom feeding), and the sheet feeder.

According to NEC, the noise level is half that of earlier 24-pin printers. If you remember the old printers, you'll appreciate the difference, and there's a quiet setting if you need it.

At $749 retail for the 80-column P6200 ($999 for the wide-carriage P6300), printing doesn't come cheap. But the hardware is solid and looks quite durable. If it holds up anything like the old NEC Spinwriters I've used, it should last for quite some time. ▹

MIKE HUDNALL



THE PRINTER WORKS JETSCRIPT-CX PRINTER

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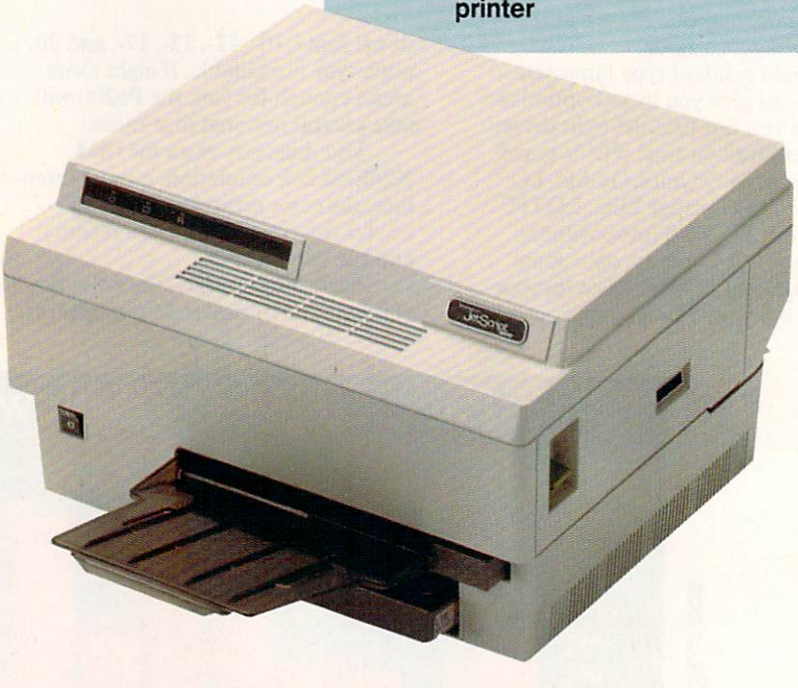


When you want true Adobe PostScript capability but you don't want to pay the authentic price, where can you go? Until now you had the choice of purchasing a low-cost PostScript clone, either resident in a printer or in a plug-in cartridge, or laying out the kids' college tuition money for a high-cost Adobe PostScript printer. But now you can purchase a real eight-page-per-minute, 300-dot-per-inch laser printer with genuine PostScript for approximately the same price as a LaserJet IIP. The Printer Works pairs reconditioned laser printer engines with the QMS JetScript product to give you just that.

JetScript consists of a long 8-bit card, a video interface cable, and the PostScript language on four double-density disks. It turns your computer and printer into a team. The PostScript interpretation that normally takes place inside the printer is performed on the board inside the computer; then the computer takes control of the imaging hardware inside the printer via the high-speed video interface, which generates the graphic.

The card comes with 3MB of RAM, so the unit doesn't have to steal very much RAM from your computer (the software uses only 3K of your system memory). You get roman, bold, italic, and bold-italic versions of Times, Palatino, Helvetica, Avant-Garde, Bookman, Courier, New Century Schoolbook, and Helvetica Narrow, plus Zapf Chancery, dingbats, and symbols—in short, the entire Apple LaserWriter Plus font list.

The installation is fairly straightforward, if you're comfortable installing boards and if you take the time to read the instructions. The software has to be installed first (a highly automated procedure); then you have to make sure certain jumpers are in the right position on the board. You slip the board into an empty slot and string the ten-foot cable to the printer. Install the toner cartridge, and you're in business.

Though inexpensive and relatively simple to set up, the JetScript package has its drawbacks. Because the PostScript is stored on your hard disk, you sacrifice about 30 seconds each time your computer boots while PostScript loads into the JetScript RAM. The printer may cost the same as a Hewlett-Packard IIP, but it takes up a slot and has the footprint of a standard-size NEC laser printer. Furthermore (and this isn't talked about very much), Adobe-sanctioned PostScript has some very real shortcomings that might force you to make compromises you could avoid with LincPage or some other PostScript clone. ▹

Ventura Publisher had no trouble printing graphics and heavily formatted text on the JetScript-CX printer. Steps had to be taken to simplify very complex *Corel Draw* graphics before they would print—a problem with PostScript, not the printer. If you are interested in a machine to do laser typesetting or proofing for desktop publishing or if you are interested in doing design or illustration work, this would be a worthy investment.

The JetScript card and new laser printer carry a one-year warranty. The refurbished laser printer comes with a 90-day warranty that can be extended to a year for $75.

ROBERT BIXBY

Dueling Printers

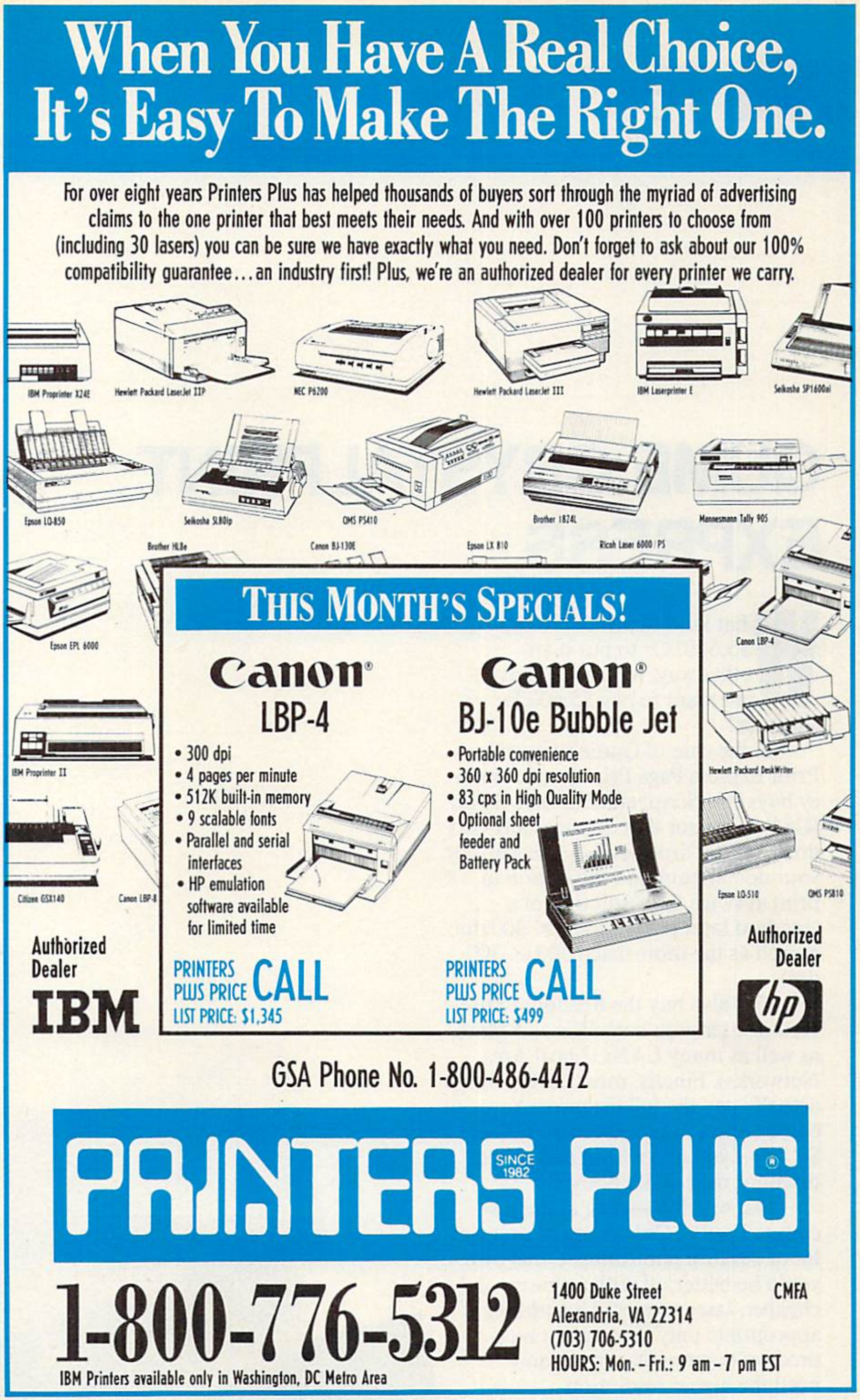
9-Pin Dot-Matrix Printers
Price Range: $150–$2,000
Print Quality: Draft to NLQ (Near Letter Quality)
Pros: Low cost, fast when used at draft quality
Cons: Noisier than other types of printers, lowest print quality

24-Pin Dot-Matrix Printers
Price Range: $275–$2,000
Print Quality: Dots per inch as good as or better than lasers', but larger dot size—overall print quality somewhat less than for laser printers
Pros: Best choice for labels and continuous and multipart forms
Cons: Noisier than other types of printers

Ink-Jet Printers
Price Range: $330–$2,800
Print Quality: Almost as good as that of laser printers
Pros: Quieter than dot-matrix printers, faster than laser printers when printing graphics
Cons: Problem with some inks that smear when wet, slower than laser printers when printing text

Laser Printers
Price Range: $800–$20,000+
Print Quality: Highest resolution, PostScript printers compatible with even higher-resolution typesetters
Pros: Capable of creating camera-ready pages for many types of publications because of their small dot size and high resolution
Cons: Require special labels that are designed to withstand heat, still expensive for home use despite the recent drop in prices

—DAVID ENGLISH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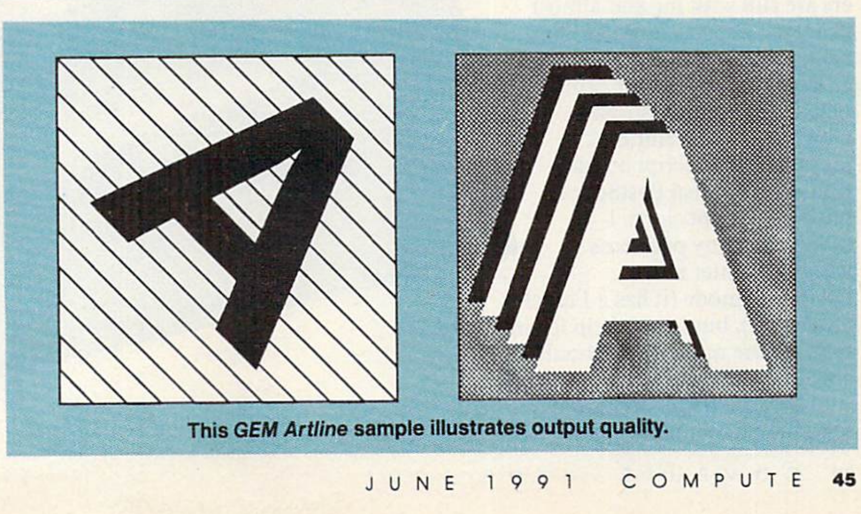
This *GEM Artline* sample illustrates output quality.

QUME CRYSTALPRINT EXPRESS

What kind of printer costs $5,600? Or to put it another way, why would anyone want to pay $5,600 for a printer?

In the case of Qume's CrystalPrint Express Page Printer, your money buys PostScript emulation, a 32-bit RISC processor that dramatically cuts down on the time you have to wait for your documents, and the option to print at twice the resolution of a standard laser printer (600 × 300 dpi, as well as the more usual 300 × 300 dpi).

You also buy the freedom to use your printer with both PCs and Macs, as well as many LANs (Local Area Networks). Finally, most buyers won't actually pay the full list price. You could expect to pay about $3,600–$4,200 if you order from one of the discount mail-order houses.

Is it worth it—even at the discounted price? Only if you're doing a lot of desktop publishing. Otherwise, you'd be better off with a slower, and cheaper, laser printer. This printer is appropriate only if you print hundreds of documents a week and need the higher resolution.

I assume the desktop publishers are still with me and almost everyone else has turned to the next page. So let's dig a little deeper into what makes this printer tick. One potential problem with the CrystalPrint Express is its PostScript emulation—it's not real PostScript but a PostScript clone. I didn't have any problems with the printer in its PostScript mode (it has a LaserJet mode, too), but I can't help feeling that, for the money, you should be able to get the real thing.

Because many desktop publishers send their documents out to be print-

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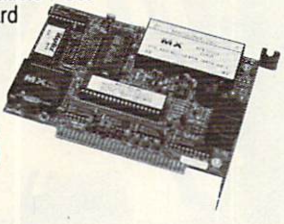

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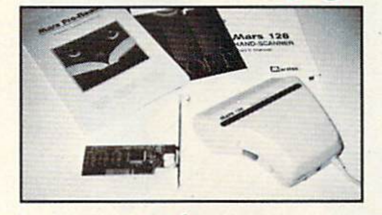

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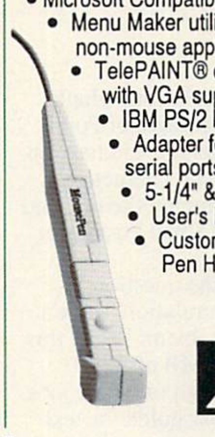
- Custom Pen Holder



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6450603	1MB SIMM PS/2 70-E61; 121	68.00
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34F2933	4MB SIMM PS/2 55SX; 65SX	279.00
6450375	1MB Mem. BD PS/2 80-041	96.00
6450379	2MB Mem. BD PS/2 80 111-321	158.00

CAT. #	DESCRIPT.	NSI
6451060	4MB Mem.BD PS/2 80-A21;A31	298.00
6450605	2-8MB Xpand Mem. PS/2 70&80 w/2MB	348.00
34F3077	2-14MB Xpand BD. PS/2 70&80 w/2MB	388.00
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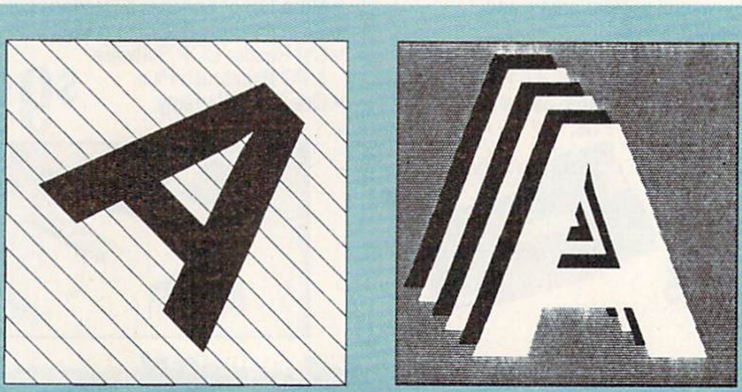


This *GEM Artline* sample illustrates output quality.

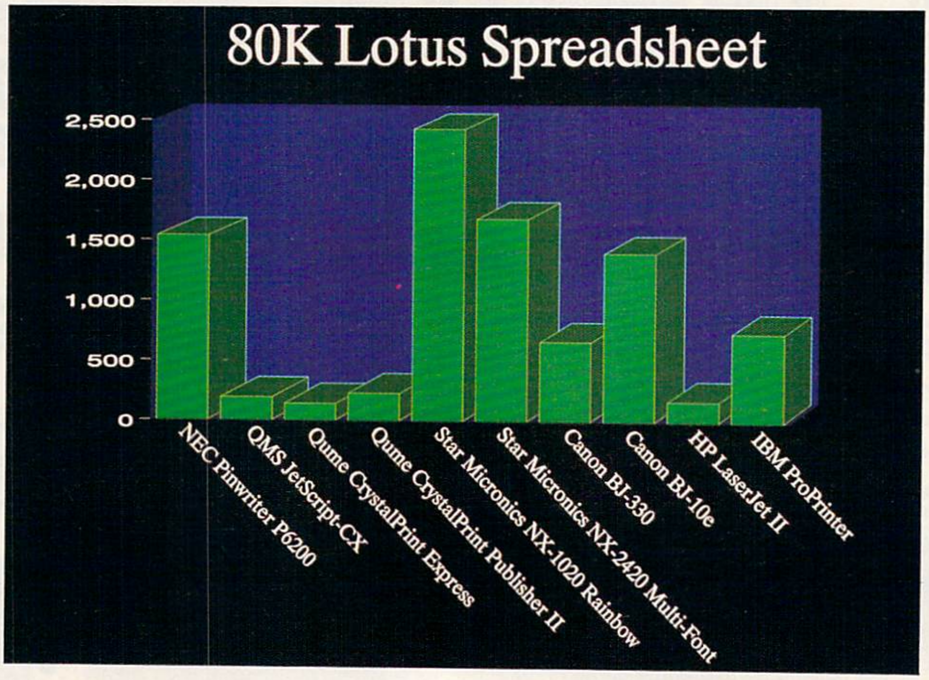
ed at even higher resolutions (that's one of the great advantages of PostScript-based documents), you have to wonder if your line and character spacing will always match the line and character spacing of a real PostScript printer.

In addition to the question of PostScript printer emulation, there's another potential problem: While this printer comes with 3MB of RAM, that may not be enough for some jobs. The printer's memory holds the text and graphics for the current page and a font cache for each of the soft fonts used for that page. In addition, if you want the printer to print at its rated speed of 12 pages per minute, you'll need to use the 2-page buffer, which uses even more memory. This buffer allows the printer to begin working on the second page of a document while the first page is waiting to be printed.

Taking advantage of all of these features can quickly consume your 3MB, especially if you're printing at the 600 × 300 dpi resolution on legal-size paper. With 600 × 300 dpi, Qume recommends 4MB for legal-size paper without the two-page buffer and 8MB for legal-size paper with the two-page buffer. In general, adding RAM will improve performance and allow you to print more complex images.

Otherwise, I have no reservations about the CrystalPrint Express. It's easily the fastest PostScript printer I've ever used, the extra resolution makes using scanned photos a real option, and it prints blacks that are solid and dark (not the blotchy grays you find with many laser printers). If you need the extra speed and higher-quality output—and you're willing to shop around for the best price—this printer is definitely worth a serious look. ▹

DAVID ENGLISH



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QUME CRYSTALPRINT PUBLISHER II

For all-around home office printing, whether text or graphics based, Qume's personal PostScript-compatible printer makes a sizable contribution to your productivity without destroying your bottom line. Its six-page-per-minute speed doesn't really rival the speed of other printers serving this market, but the overall print quality is superior to that of many lower-cost lasers. Add to that the ease with which you can switch from HP emulation to PostScript printing, and you have the makings of a solid performer.

I've experimented with a lot of printers over the last six years, which means I've suffered through countless installation agonies and false starts. The CrystalPrint was no better or worse than most laser printers. You have to handle the drum kit and toner accessories with care and be careful to read all of the instructions. Like most of its cousins, this laser printer could have used a quick installation guide comprised of very clear instructions and plain illustrations. I've yet to discover why so many manufacturers of such complex equipment don't include these guides. Using the owner's manual, I had the printer up and running in a couple of hours, which included skimming the documentation to familiarize myself with the printer's basic operations.

Once online, the CrystalPrint lived up to all of my expectations, and then some. Text printing was clear and quick—I had no problems configuring the system to produce *XyWrite* and *GrandView* text files. Using the HP emulation mode and *Ensemble,* I was able to print graphics and type in a variety of styles and faces with ease. Printing

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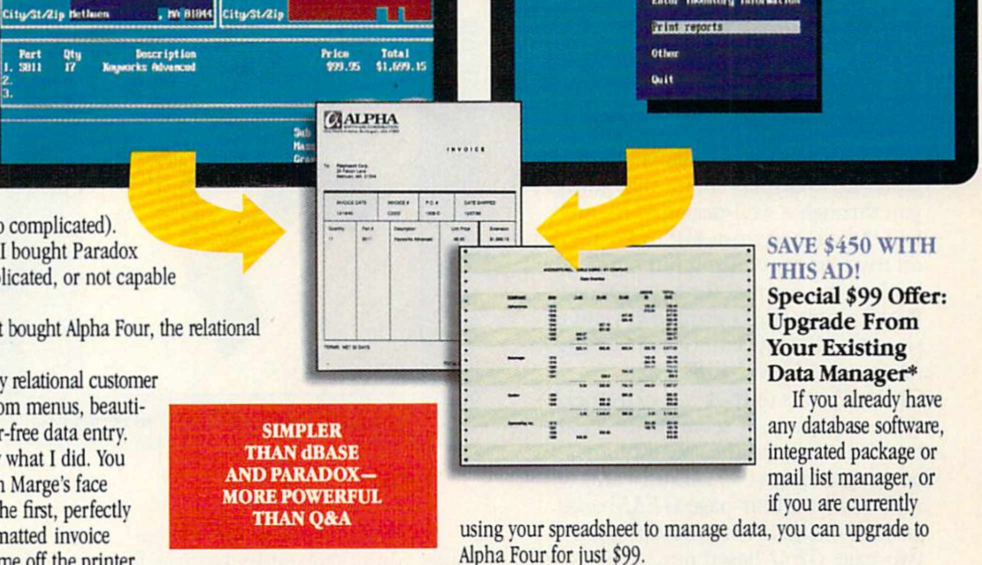
...but after a few hours with Alpha FOUR,® I had a fully operational application!



```
Instruction                 No
                            Pre-Paid
                            C.O.D
Bill To :                   Ship To :
Company      Ralphasoft Corp.      Company    Same
Address      28 Falcon Lane        Address
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   Part    Qty     Description              Price     Total
1. 3011    17      Keyworks Advanced        $99.95    $1,699.15
2.
3.
```

```
Enter a new customer
Create an invoice
Enter inventory information
Print reports
Other
Quit
```

At our Monday morning staff meeting, I announced I was going to automate our sales tracking and invoicing system later that day.

Skepticism ran high. "Paul, you promised me an application like that two years ago," said Marge. "You couldn't do it, and neither could that dBASE programmer you hired. It'll never happen!"

I'd already tried three times before to program a database: first with dBASE (much too complicated). Then I tried Q&A (not powerful enough). Then I bought Paradox (just like dBASE). They were all either too complicated, or not capable enough for our needs.

This time, I was confident. Why? Because I just bought Alpha Four, the relational database for non-programmers like me.

I knew within hours, I'd be able to build a fully relational customer tracking and billing system, complete with custom menus, beautiful screens and extensive help messages for error-free data entry.

And that's exactly what I did. You should have seen Marge's face when the first, perfectly formatted invoice came off the printer.

I DEVELOPED MY APPLICATION & REPORTS IN MINUTES

With the "application outliner," I automatically set up a system of menus, sub-menus, and procedures based on the outline I laid out.

Alpha Four's report writer was even more impressive. I "painted" reports and invoices on-screen. They looked exactly like I wanted them to—much better than our old paper forms. I always ran out of power with other simple-to-use databases; they weren't relational. With Alpha Four, I created different databases for customers, invoices and inventory and then related them into a "set," just by drawing on-screen, a diagram of the links between the databases.

I'LL NEVER KEY IN DATA TWICE AGAIN

Now, we never have to enter the same information more than once. New invoices can be generated for existing customers without having to re-enter their information—we just "look it up" in our customer database.

And I was delighted that Alpha Four is totally compatible with dBASE .dbf files. Our mailing list went right into the new application without even having to convert the files!

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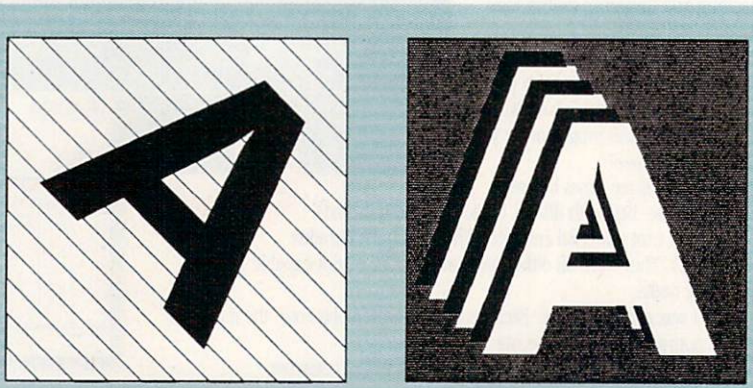
benchmarks performed for *COMPUTE's* Test Lab clocked an 80K *Lotus 1-2-3* spreadsheet at three minutes and 49 seconds.

Switching to PostScript emulation is made easy by means of a front-panel LCD display menu that guides you through a well-designed menu tree. I switched from HP to PostScript on my first try without having to go back to the manual for help. Once in PostScript mode, I printed several designs and layouts composed in *PageMaker* and *CorelDRAW*. The CrystalPrint's output was extremely clear and sharp. A separate Test Lab benchmark rated the speed of PostScript printing at 15 minutes and 6 seconds for a four-page *GEM*-based graphic design. A second design, a two-page *GEM*-based newsletter, was rated at 4 minutes and 43 seconds.

Paper-handling features consist of a single 100-page paper tray and manual feed. The CrystalPrint will handle regular-size paper, as well as legal size, mailing labels, envelopes, and transparencies. It prints in landscape and portrait modes.

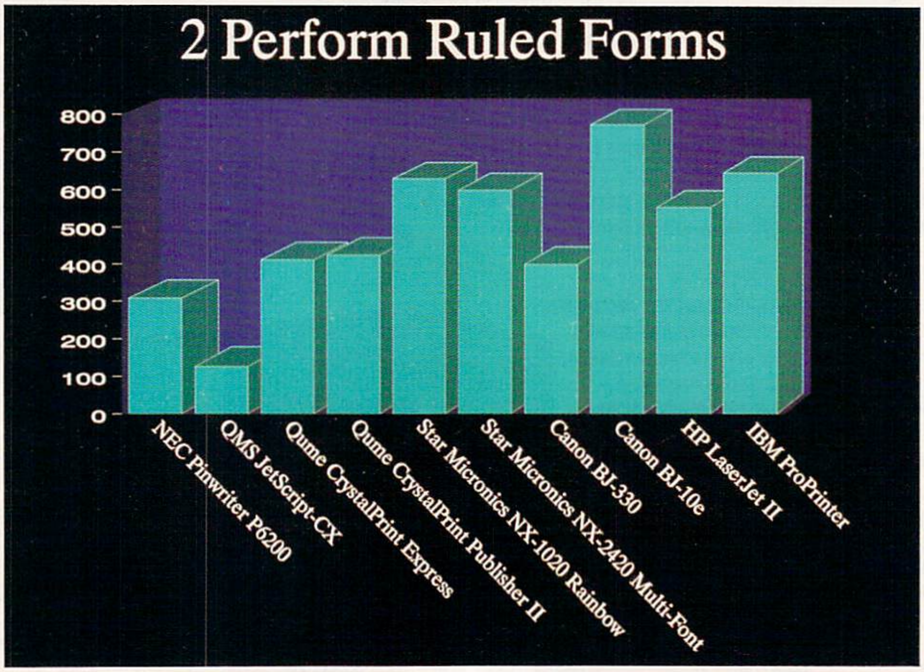


This *GEM Artline* sample illustrates output quality.

If your office at home is like mine, you're constantly battling for space. The CrystalPrint is fairly compact for a personal laser printer. I do wish, however, that the engineers had devised a "quiet mode" for times when the printer wasn't in use but was switched on. I found the idle noise level distracting within the confines of my small office.

Still, the CrystalPrint is a welcome addition to the home system of anyone looking for the best in printer output. Not everyone requires PostScript-quality graphics, or even laser-printer quality. But if you do, then this printer's easy versatility and excellent output quality make it a prime candidate for you. ▹

PETER SCISCO



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STAR MICRONICS NX-1020 RAINBOW

Star Micronics' latest Rainbow release is a solid performer at a reasonable cost. The 1020 Rainbow boasts just enough special features, not only to set it apart from other low-cost dot-matrix printers, but also to make it worth considering over certain 24-pin models.

Top on the features list, obviously, is color. Adopting the Epson FX-850 emulation (the standard setup out of the box) allows the Rainbow to use the ZX9CL ribbon to print colorful documents from software that supports color printing. (Star is readying drivers specifically designed for the 1020 Rainbow; a *Windows* driver is already available, if you're using graphics programs in that environment.)

You can easily control color printing from the printer's front panel with the template card that Star provides. The plastic card fits over the control panel and indicates which button to press for selecting various colors. The selections are also documented in the manual, but it's much easier to use the card—keep it in a safe place.

The front panel controls much more than color, however. From here you can also control print modes, fonts, and paper handling. It's this last that makes the 1020 Rainbow worth considering as a low-end printer. The printer's paper-parking and sheet-feeding mechanisms work flawlessly, once the paper is properly loaded. These features allow you to print single sheets without having to completely unload tractor-fed paper. In addition, the printer handles multipart forms, which are useful for invoicing and shipping in a home office setting. Tractor-fed paper can be loaded either from the back or the bottom of the printer, giving you further options in placing your printer in the office.

Print quality from the 1020 Rainbow is what you'd expect from a nine-pin dot-matrix printer. From a high-speed draft mode to a Courier typeface in near letter quality (NLQ) mode, your printouts will serve the purposes for which they were designed. Draft mode is very quick and

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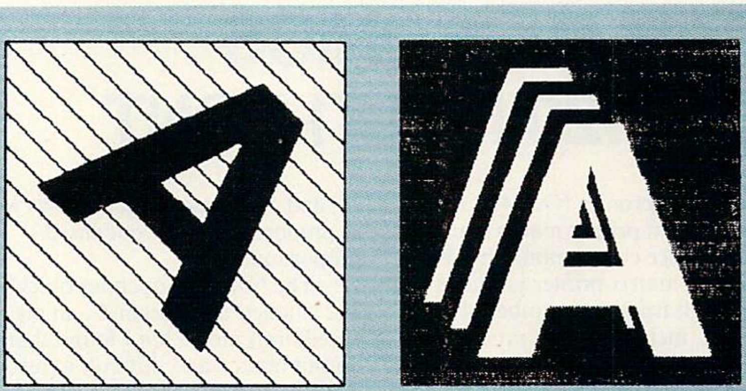
(212) 986-6770
List Price: $329
Street Price: $184

star
NX-1020 RAINBOW
star / NX-1020



This *GEM Artline* sample illustrates output quality.

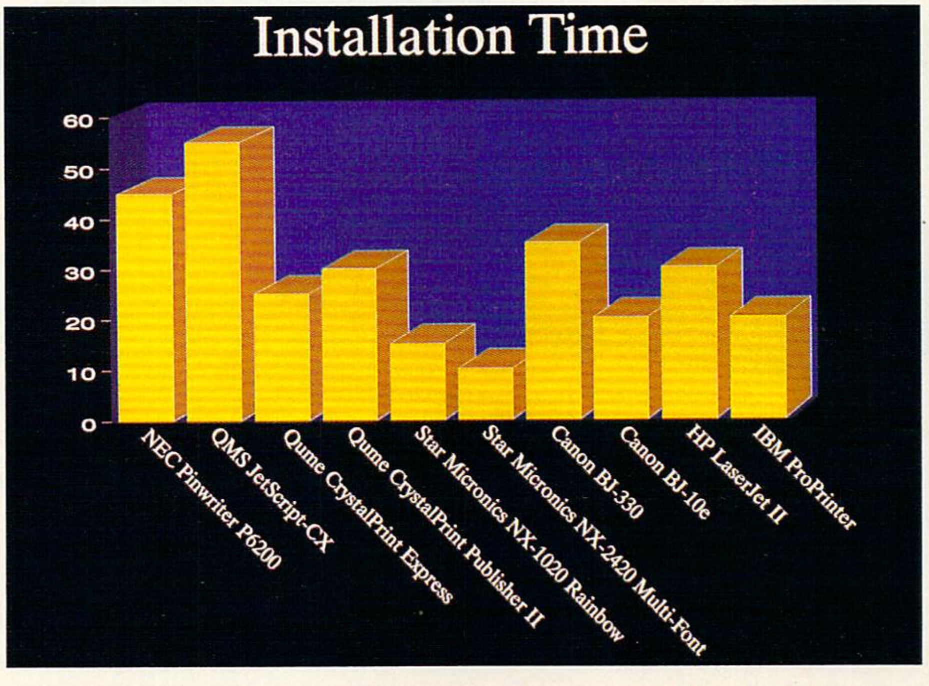
readable; NLQ in both serif and sans-serif faces is very presentable for short documents; a Script typeface is useful for documents needing a special touch.

Noise levels at home are a real concern, and impact printers are notorious for their high noise levels during operation. Star has mitigated this effect somewhat with a rounded, ergonomic design that somewhat muffles the machine noise, insofar as the noise level of a nine-pin printer can be muffled. The noise level is not so annoying that it requires you to leave the room when printing, but it will prove distracting during telephone calls.

Star built this printer for the first-time buyer and for home office workers who need a printer with solid paper-handling features at a low price. Both of these groups could do with better documentation than is provided with this printer. The manual is, in many respects, quite complete, and it covers everything from initial setup to external commands that you can send from your computer for advanced functions. There's even a section that explains how to create your own characters to use with the printer. For all of those excellent qualities, however, the manual assumes, perhaps wrongly, that the user knows a fair amount about printers. A second brief "starter guide" that describes printer setup, paper loading, and front-panel controls in general nontechnical language would be a superb addition to the 1020 Rainbow package.

Designed for low-volume home use, the NX-1020 Rainbow is a solid performer with superb paper-handling features and the added benefit of color printing. If you're in the market for a printer and you want to keep your costs down while maintaining a professional presentation, the Star Micronics NX-1020 Rainbow is an attractive option. ▹

PETER SCISCO



STAR MICRONICS NX-2420 MULTI-FONT

The Star Micronics NX-2420 Multi-Font printer makes a pretty good office companion. This 24-pin dot-matrix printer produces good output from any number of applications, including word processing, spreadsheet, and accounting programs.

With a fresh ribbon, the NX-2420 in letter-quality mode produces fully satisfactory output for most correspondence and for in-house reports. Five letter-quality fonts are provided, and each style offers the usual italic, bold, and large-sized print variations.

In addition, the Star operates at several pitch settings including 10, 12, 15, and 17 characters per inch as well as proportional and condensed proportional.

The NX-2420 operates quickly—222 characters per second—in high-speed draft mode, but I found that output broken and difficult to read. Regular draft mode, which prints at 167 cps, produces more readable documents. Letter-quality output is rated at 55.5 cps.

The NX-2420 is generous in paper-handling options. Single sheets, fanfold paper, and multipart forms of up to five ply all work in this printer. You'll use the friction feed for single sheets, and you can use either rear loading or bottom loading for continuous forms.

If you use the rear-loading option, paper feeds through the back of the machine into the tractors which push the paper through the paper path. Although this setup affords the convenience of paper parking, so that you can print on single sheets without unloading the fanfold paper, it also produces a higher incidence of paper jams. On the other hand, these jams are only occasional, and the parking feature is a tremendous advantage for an operator who often switches between letterhead and continuous-feed paper. ▹

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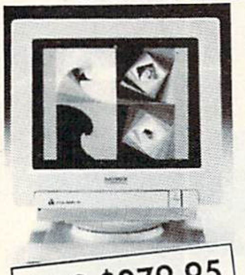

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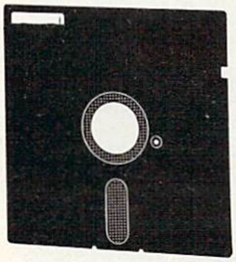

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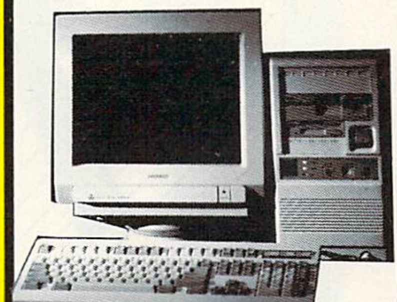

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The bottom-feed option moves the paper around the platen and then into the tractors. In this configuration, the tractors pull the paper through the print path, resulting in a smoother operation. This option is recommended for multipart forms.

The Star's noise level is average, and if you need it, you can take advantage of the printer's quiet mode, which can make working near it more pleasant. However, selecting quiet mode cuts the printing speed significantly.

The front panel houses five buttons for selecting options and defaults. By pressing combinations of these buttons, you select fonts, adjust paper positioning, or change printer settings. The most commonly used functions are labeled on the faceplate, and templates offer guidance for lesser-used functions.

The NX-2420 allows you to select font, pitch, and autoload settings and record them as a macro that's executed on power-up.

With the NX-2420, you get a 7K buffer and the option to expand your capabilities with either a font cartridge or a RAM cartridge. The printer supports two graphics sets and 16 international character sets.

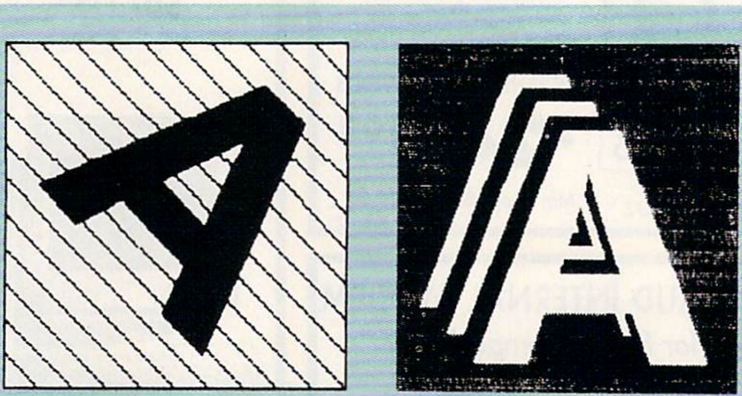
Because the printer emulates either Epson printers or the IBM ProPrinter, it's quite easy to locate drivers appropriate for most applications.

In short, the NX-2420 provides good print quality and plenty of features. It's a printer you can count on to handle a variety of tasks.

TONY ROBERTS

For a full listing of printer features, see the grid on p. 60.

All Benchmark/Performance Testing is conducted by Computer Product Testing Services, Inc. (CPTS), using benchmark software developed by COMPUTE Publications International Ltd. CPTS is an independent testing and evaluation laboratory based in Manasquan, New Jersey. Every effort has been made to ensure the accuracy and completeness of this data as of the date of testing. Performance may vary among samples.



This *GEM Artline* sample illustrates output quality.

Printer Glossary

dot-matrix printer. A type of impact printer that uses a ribbon and wires to transfer dots of ink onto paper. See also **pin.**

dpi (dots per inch). A standard for printer resolution that measures the number of dots a printer can place along a linear inch. Laser printers are typically rated at 300 dpi.

draft quality. The lowest print-quality setting of a printer. Because the printer puts less ink on the page, this is usually the fastest print mode. Most often associated with dot-matrix printers.

emulation. The ability of a printer to mimic the functions of a similar, but incompatible, printer. Many printers contain the code to emulate one or more standard printers, such as an Epson FX-80, a Hewlett-Packard LaserJet, or an Apple LaserWriter Plus.

font. A printer typeface or family of typefaces. Each font has a particular design but may include different styles and sizes. Most higher-resolution printers allow a choice of font.

ink-jet printer. A type of printer that uses a mechanism that sprays ink onto paper.

laser printer. A type of printer that uses the electrophotographic method used in copy machines. Laser printers print an entire page at a time.

near letter quality. Print quality that approaches the quality of a standard office typewriter. Abbreviated *NLQ.*

near-typeset quality. Print quality that approaches the quality of a typesetting printer.

pin. One of a series of pins located in the printhead of a dot-matrix printer. Each pin produces a dot at a specified location on a printed line of text. See also **dot-matrix printer.**

print driver. A device driver that converts a program's generic printer output into the codes required by a specific printer.

printer buffer. A hardware- or software-based memory device that accepts printer data from a computer and holds it until the printer is ready for it—thus freeing the computer for other use. The process of using a print buffer is often referred to as *print spooling.*

sheet feed. A mechanism that moves single sheets of paper through a printer. See also **tractor feed.**

tractor feed. A mechanism that moves continuous paper through a printer. The paper must have prepunched sprocket holes on both the left and right sides. Also known as *pin feed.* See also **sheet feed.**

—DAVID ENGLISH

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Comparison of Printer Features

	Canon BJ-10e	Canon BJ-330	Fujitsu DL4600	NEC Pinwriter P6200	The Printer Works JetScript-CX	Qume CrystalPrint Express	Qume CrystalPrint Publisher II	Star Micronics NX-1020 Rainbow	Star Micronics NX-2420 Multi-Font
WARRANTY	1 year	1 year	1 year	1 year	1 year new, 90 days refurbished	90 days on-site, 1 year return-to-depot	90 days on-site, 1 year return-to depot	2 years	2 years
HEIGHT	1.9"	5.4"	7.5"	8.25"	11.4"	13.4"	9.1"	5.3"	6.1"
WIDTH	12.25"	23.3"	22.9"	17.3"	18.7"	16.6"	15.7"	17.3"	18.2"
DEPTH	8.5"	13.7"	15.2"	14.2"	16.3"	17.8"	13.4"	13.1"	14"
WEIGHT	4 lbs.	19.4 lbs.	39.7 lbs.	23 lbs.	55 lbs.	75 lbs.	35.2 lbs.	13.9 lbs.	14.6 lbs.
PRINT COLOR	b&w	b&w	b&w/color	b&w/color	b&w	b&w	b&w	b&w/color	b&w
PRINT MECHANISM	bubble jet	bubble jet	matrix	matrix	laser	laser	liquid crystal shutter	matrix	matrix
PRINT SPEED	LQ/economy 83 cps	HS draft 300 cps, LQ 150 cps	HS draft 333/400 cps (10/12 cpi), draft 222/266 cps (10/12 cpi), LQ 111/133 cps (10/12 cpi)	HS draft 300 cps, draft 200 cps, LQ 150 cps	8.1 PPM	12 PPM	6 PPM	HS draft 225 cps, draft 180 cps, NLQ 45 cps	HS draft 222 cps, draft 200 cps, LQ 67 cps
INTERFACE									
Parallel	●	●	●	●	○	●	●	●	●
Serial	○	●	●	●	○	●	●	●	●
PostScript	○	○	○	○	●	●	●	○	○
SCSI	○	○	○	○	○	○	○	○	○
AppleTalk	○	○	○	○	○	●	●	○	○
EMULATIONS	IBM ProPrinter, Bubble Jet 130e	IBM ProPrinter XL24E, Epson LQ-1050	IBM ProPrinter XL24, Epson LQ-2500, Fujitsu DPL24C+	Epson LQ, NEC Pinwriter, IBM X24E/XL24E	PostScript	HP-PCL4, PostScript	HP-PCL4, PostScript	IBM ProPrinter III, Epson FX-850/EX 800	IBM ProPrinter X24E, Epson LQ-860
BUFFER/STANDARD RAM	37K	30K	256K	80K	3MB	3MB	3MB	16K	7K
RAM EXPANSION CAPABILITIES	n/a	n/a	n/a	n/a	n/a	to 8MB	to 6MB	n/a	39K
RESOLUTION (DPI)	economy 180 × 360, HQ 360 × 360	360 × 360	360 × 360	360 × 360	300 × 300	standard 300 × 300, enhanced 600 × 300	300 × 300	216 × 240	360 × 360
NUMBER OF INTERNAL FONTS	2	3	5	8	35	31 HP, 39 PS	31 HP, 39 PS	6	7
FONT CARDS/ CARTRIDGES	n/a	4	7	8	n/a	n/a	n/a	n/a	4
PAPER HANDLING									
Tractor push	○	●	●	●	○	○	○	●	●
Tractor pull	○	○	●	●	○	○	○	●	●
Friction sheets	●	●	●	●	●	●	●	●	●
Trays	○	○	○	○	●	●	●	○	○
Sheet feeding	●	●	●	●	●	●	●	●	●
Envelopes	●	●	●	●	●	●	●	●	●
Labels	○	○	●	●	●	●	●	●	●

● yes ○ no

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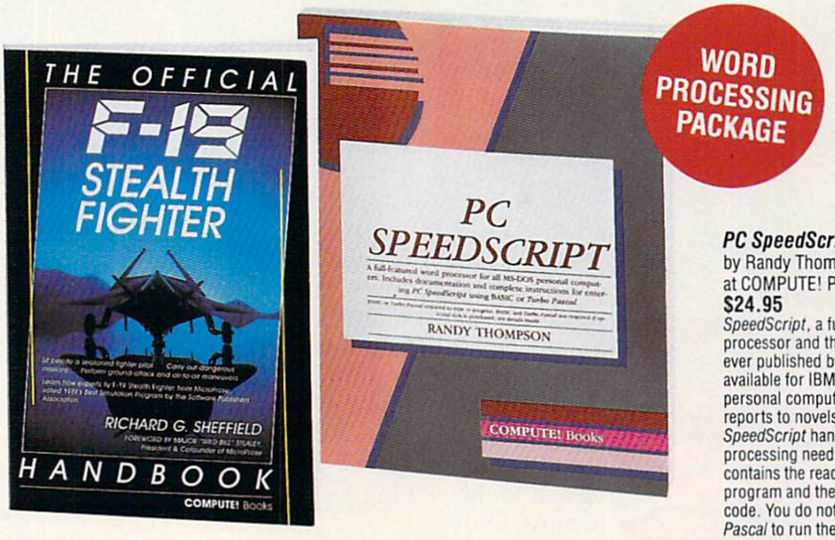

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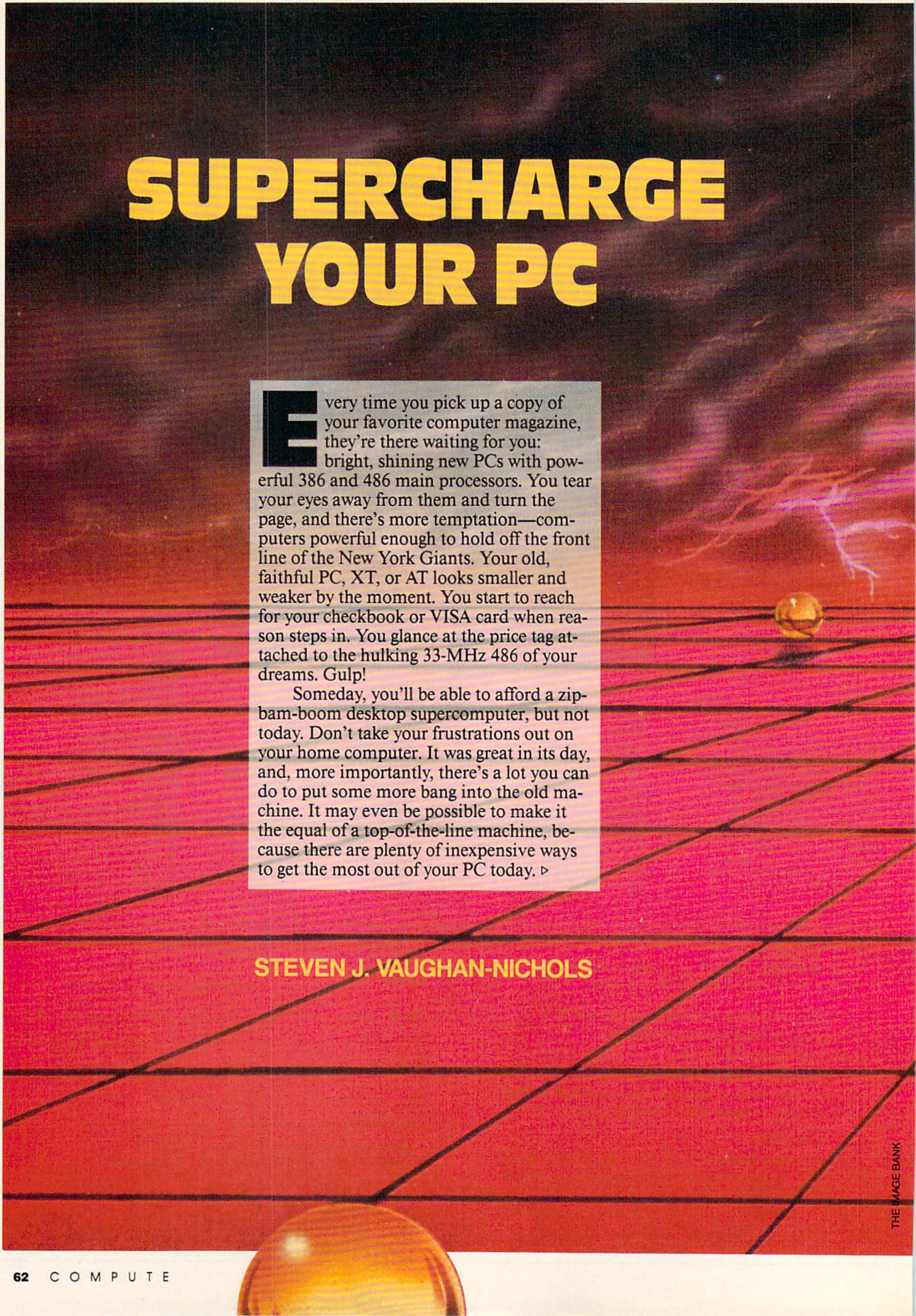


THE IMAGE BANK

Every time you pick up a copy of your favorite computer magazine, they're there waiting for you: bright, shining new PCs with powerful 386 and 486 main processors. You tear your eyes away from them and turn the page, and there's more temptation—computers powerful enough to hold off the front line of the New York Giants. Your old, faithful PC, XT, or AT looks smaller and weaker by the moment. You start to reach for your checkbook or VISA card when reason steps in. You glance at the price tag attached to the hulking 33-MHz 486 of your dreams. Gulp!

Someday, you'll be able to afford a zip-bam-boom desktop supercomputer, but not today. Don't take your frustrations out on your home computer. It was great in its day, and, more importantly, there's a lot you can do to put some more bang into the old machine. It may even be possible to make it the equal of a top-of-the-line machine, because there are plenty of inexpensive ways to get the most out of your PC today. ▹

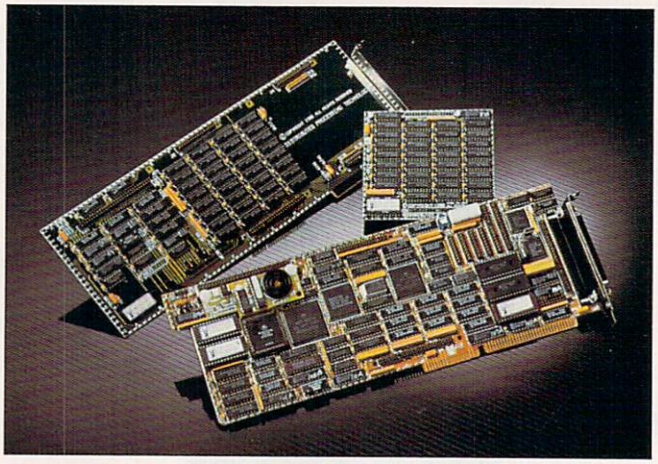
STEVEN J. VAUGHAN-NICHOLS

Hard Decisions

Let's start with your hard disk. What's that you say? You don't have one? A hard disk is easily the biggest performance booster you can get for any MS-DOS–based machine. Many modern-day programs absolutely require one.

Choosing a hard disk isn't easy. There are hundreds of different models for sale, but there are a few things that you should look for when shopping around. The first is a good warranty. It doesn't matter how fast the hard disk is if all it does is sit and blink its lights at you. Second, if you own an AT or a fast XT (10-MHz or better), you're best off getting a drive with an access time of 28 milliseconds or less. Slower machines can get by with 40-millisecond drives. It's easy to make recommendations about how big a drive to get: Buy the largest hard disk you can afford.

No matter how many megabytes of storage you get, you'll run out. Everyone does. So you might as well put off that day as long as you can. The problem is that even if you're good about trashing old files, disk space is grabbed up by fat modern software. You can easily fill a 20MB hard disk with no more than three or four of today's heavyweight programs.



Any AT-compatible system with an ESDI, MFM, or RLL hard drive will get a jet-assisted boost with this controller.

Double Your Drives

If you already have a hard drive, think about adding another one. Most computers can handle two drives without any problems. For that matter, you may want to think about replacing your current drive. Newer hard drives are bigger, faster, and cheaper than their immediate ancestors. Check with a knowledgeable friend or a technician before putting your dollars down, but the odds are that you can dramatically improve your storage capacity.

If you don't know the first thing about your computer's insides, you may hesitate to install a hard drive. It's not a difficult job, but if you're like me and can't remember which end of the screwdriver to use some days, you may be better off going with another option. That other path is to add a hard card to your system. These cost more than hard drives, but almost anyone can install them. All that's usually required is for you to find an empty slot in your PC and push in the card.

Plus Development makes my favorite hard cards. They're more expensive than some of the others, but they're great performers. Their two main cards are the Hardcard II 40 and 80. Respectively, they hold 40MB and 80MB of data. They can access this information at speeds well below 28 milliseconds.

Another advantage of these cards is that they'll take up only one slot in your computer. Many hard-card companies claim that their cards use only a single slot, but the large size of their disk compartment makes that debatable.

Main Squeeze

If a second drive is beyond your budget or your computer's capabilities, there's a way to squeeze more information into the same old disk real estate: data compression.

There are two ways of using data compression to get more room on your disk. The first is to use a program like *PKZIP*. This is a shareware program that's widely available on online services and bulletin board systems. If you don't have access to a modem, you're not out of luck. There are several companies that will sell you disks containing *PKZIP* and similar programs. You'll still have to pay their makers if you decide to use the programs, but they're quite inexpensive.

How They Work

These programs work by taking your files and encoding them in a space-saving format. Usually, *PKZIP* will shrink a file down to about 50–66 percent of its original size. It'll work even better on database files and spreadsheets. You can't use these files while they're in their mashed-down state, but it only takes a few seconds to restore them to full size when you need them. These programs are ideal for storing away old files that you may need someday or even software packages which you don't access every day.

There is only one real problem with data-compression programs; they're a pain in the neck to use. You don't have to be a computer wizard to use them, but it doesn't hurt! Fortunately, there are several applications that tame compression software for home use. Two excellent examples, which are also available online, are *SHEZ* and *ArcMaster*.

There's an even easier, faster way of crunching information into smaller packets now coming onto the market. Boards and disks with dedicated data-compression chips will soon appear on store shelves. These will enable you to pack into your disks half again as much information as you can now store. This isn't the first time that those claims have been made, but previous products didn't live up to expectations. This new generation of data-compression chips, from InfoChip Systems and Stac Electronics, should make the promise of fast, transparent data compression a reality.

Cache and Carry

Getting more storage is only part of the hard disk story. If you're like most users, you want more speed. Nothing is more boring than sitting around waiting for an application to load. There are two ways to improve this situation. The first is to use a disk cache. Any hard disk will act like a hot rod with a cache.

Let's face it—no matter what you do with a disk, you're still stuck with moving parts. There's no way a mechanical subsystem can compete with electrons coursing through doped silicon. Caches put frequently used information into memory, where it can be found in a fraction of the time it takes to find it on a disk. How much of an improvement do you get? In tests over the years, I've found that caching with disk-intensive programs like database managers cuts the time spent reading and writing to disk by 90 percent. Can you say *vroom?*

There are two basic ways you can add caching to your computer. If money is no object, you can take the expensive route and add a caching drive controller to your system. These controllers not only take care of managing your hard drive, but their dedicated RAM holds frequently used data for superquick access. Caching controllers can really give your tired old drive a rocket boost, but their speed comes at a price. ▹

The SmartCache controller from Distributed Processing Technology is an excellent example of its kind. This full-length card comes with 512K of memory. Any AT-compatible system with the common ESDI, MFM, or RLL hard drives will get a jet-assisted performance boost with this controller. Programs like *dBase IV* that usually seem to take forever to load will leap onto the screen. If half a megabyte of cache isn't enough, you can attach 2MB or 4MB daughtercards to the main card. With that much additional RAM, even notorious disk slowpokes like *Windows* 3.0 will snap to attention on your monitor. So why not run out and get one today? Many users will find the price tag of $1,230 a mite steep for their tastes.

Because of their price, caching controllers may only appear in business offices. Don't despair; there is a way to get almost the same benefits at home with software caching.

The best thing about software caching is that you already have some basic caching tools in DOS. The BUFFERS parameter (in your CONFIG.SYS file) stores data in 512-byte chunks. If you set buffers to 10 (BUFFERS=10), for instance, you'll have a small cache of 5K.

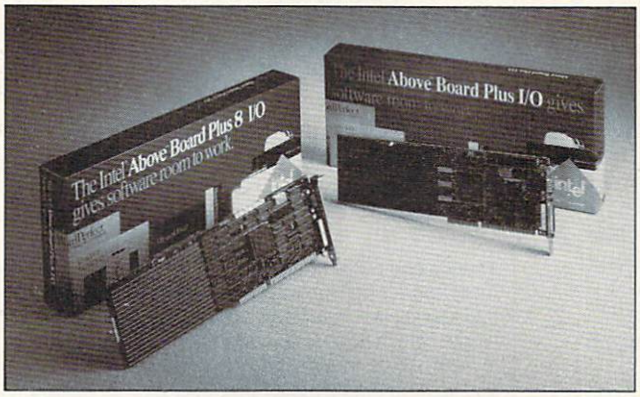
If you have MS-DOS 3.3 or above, you can get a boost from another free goody: FASTOPEN. This denizen of CONFIG .SYS stores the location of your most recently visited directories in RAM. By doing this, changing directories goes faster. The increase is small, but it is there.

While the DOS commands have the sterling virtue of being essentially free, commercial caching programs are much better at improving your disk input/output. I have two favorites here: Multisoft's *Super PC-Kwik* and Golden Bow's *Vcache.* Both will happily use any kind of memory you have: expanded, extended, or (if you *have* to) conventional. Both are easy to use and get really high-octane speeds from your drive. The only thing you need to be concerned about is that they use up at least a little of your 640K of conventional memory. It's a small price to pay for the gains they provide.

Golden RAM

Another way to put some bang into your old machine is to use a RAM disk. This is simply using a program (most MS-DOS variations come with one named either VDISK.SYS or RAMDRIVE.SYS) to set aside a chunk of memory to act like a disk drive. This is different from a cache in that a cache just speeds up data moving to and from a hard disk. In a RAM disk all the information is kept in high-speed RAM as if it were on a disk. You wouldn't want to keep an important spreadsheet in one, since an accidentally pulled plug or a momentary power failure would mean the end for them. What you can do is put application programs—or at least parts of them—into the RAM disk.

Take for instance that old warhorse of a word processor, *WordStar.* Like many other programs, early versions of *WordStar* came in several parts, including the main program and what are called *overlay files.*


The Intel Above Board Plus 8 I/O gives software room to work.
The Intel Above Board Plus I/O gives software room to work.

This full-size card comes with 2MB of RAM, an easy-to-use installation program, and excellent technical support.

Overlays contain routines that aren't used as often as the heart of the software. To save memory, these procedures are left on disk until they're needed. By placing these files in a RAM disk, you can speed up *WordStar* by as much as 200–300 percent. Many other programs will show similar increases from the same treatment.

If you have room for a truly large RAM disk (several megabytes), you can load entire programs into RAM. *Quattro Pro,* Borland's popular spreadsheet, performs phenomenally when used in this way. If you've never used one, you can't appreciate how much faster a RAM disk makes things go. It's like the difference between a dump truck and an Indy 500 racecar.

Elephantine Memory

Of course, while software caching and RAM disks are wonderful things, there is this one tiny problem. They all require more *RAM.* One straightforward way of improving your system is to add more memory. As I write this, in late February 1991, RAM prices are down to $50 a megabyte. Prices will probably continue to drop. One of the best ways to get more out of your PC is to add memory. You can't afford not to do it.

Adding memory chips can be tricky, so you may want to call in professional help. Some systems won't accept additional memory or will only take a small amount.

Memory chips are packaged in four different ways: Single In-line Memory Modules (SIMMs), just the chips themselves (usually called DRAMs for Dynamic Read Access Memory), Single In-line Pin Packages (SIPPs), and Dual In-line Pins (DIPs). Chances are about 999 to 1 that your PC can use only one of these forms of RAM. The others would be worthless to you. You also need to be certain to buy only memory of the same capacity and speed. It's sometimes possible to mix, say, 256Kb (kilobit) and 1Mb (megabit) chips or 80ns (nanosecond, access time of billionths of a second) and 100ns chips on the same motherboard, but that's a game that only professionals should play.

RAM added to the motherboard is generally set up as extended memory. Extended memory can only be used with the 80286 and later CPUs. Another option is expanded memory. Their names are similar enough to confuse most nontechnical people. The 80286 and its newer cousins can access many megabytes directly, eliminating the concept of conventional RAM and the 640K barrier. Older CPUs must use special techniques to move information between conventional RAM and added RAM. Expanded memory swaps a certain section of conventional RAM with expanded RAM. This technique was wildly popular when it first emerged, but with many users turning away from the 8088 and 8086 machines and embracing the more advanced CPUs, expanded memory is declining in popularity, and extended memory is in ascendancy.

Expanded memory is one way to quickly and simply add memory to a system without sweating over memory chips. Expanded memory is sold on expansion cards that you can buy already populated with RAM. Normally, these cards support LIM 4.0 expanded memory. This kind of memory is used by many popular programs like *Lotus 1-2-3* and *DESQview.*

Even if you need to add RAM to an expansion card, it's usually much easier to add chips to one of them than to your motherboard. After all, you can set the card down in a position that's well lighted and comfortable. Unless you feel confident enough to tear your machine apart, that's more than you can do with the motherboard.

I've used several of these cards over the years. The clear winner has been Intel's Above Board Plus 8 I/O with 2MB. It's a mouthful of a name, but it's a heck of a board. This full-size gem of a card comes with 2MB of RAM, an easy-to-use software installation program, and excellent technical support. When you're working interfaces like *Windows* 3.0 to their limits, you can add up to another 12MB to the board.

You may be able to get more memory out of the system you already have. Sound incredible? It is incredible, but it does work. DOS is a rather messy operating system, and it doesn't take full advantage of the memory in your system. Programs like Quarterdeck's *QRAM* for 8088 and 80286 machines and *QEMM* for 386 machines can liberate almost 100K of memory for direct use by programs. These programs, and others like them, won't always work. That's because not every machine's architecture has hidden memory treasures. If you're willing to live without programs that use graphics, these programs can almost always let you grab an additional 96K of RAM.

The Tsars of TSRs

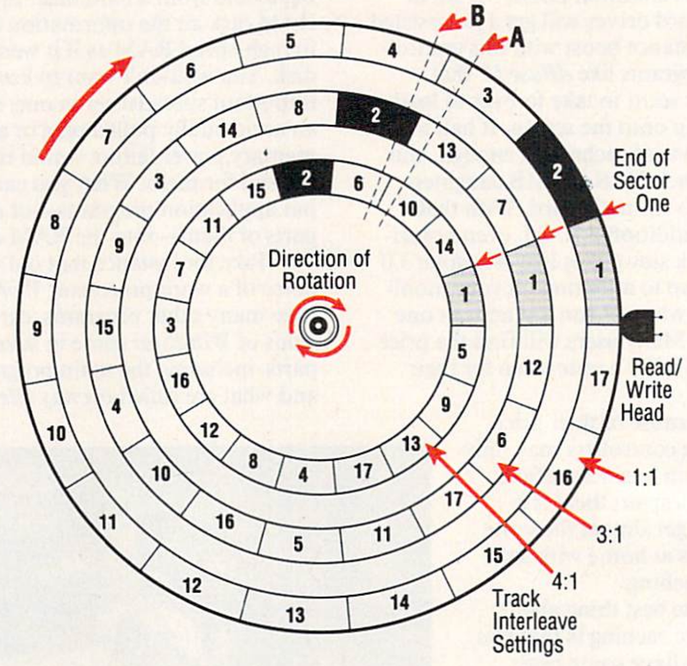
If you're feeling severe RAM cram from overly plump programs and a surfeit of terminate-and-stay-resident (TSR) programs, *Mark* and *Release* (part of a freeware package from TurboPower known as *TSR Utilities*) are two programs that let you rein in out-of-control TSRs.

The programs work in tandem. *Mark* loads TSRs into memory, and *Release* takes them out of memory when you need every last K you can get. It's not as nice as having additional memory, but it is the next best thing. The most attractive thing about this powerful pair is the price. You can download and use this utility package at no charge or purchase it from TurboPower for $20.

Boards and Chips

If you're a spreadsheet fan or you use serious graphics software, you can help yourself by adding a math coprocessor. These specialized chips can do in a flash the heavy math that bogs down any CPU (except the 80486). There are many different math coprocessors, but you will want to be sure that yours is completely compatible with your software. For that reason, it's best to ignore price advantages and stick with the Intel

Interleave Made Easy



COURTESY OF STEVE GIBSON RESEARCH

There's one performance boost that's almost free—adjusting your disk's interleave. Interleaving is a method of storing data on a hard disk that, if set up correctly, results in faster, more efficient transfer of information between computer and disk. To check (and possibly change) your disk's interleave, you can use *Interleave Adjustment Utility,* found on this issue's *PC Disk.* To understand how interleave affects performance, read on.

A disk's interleave, which is expressed as a ratio, is an indication of how much data can be read and transferred from disk to CPU in relation to how far the disk has rotated.

An interleave of 1:1 indicates that one sector is read and transferred for each sector that passes under the drive's read/write head. This is the ideal setting, resulting in the fastest transfer of data. The accompanying graphic illustrates this arrangement by showing data written sequentially on each of the disk's 17 sectors.

However, not all disk/controller/CPU combinations can operate at such a rate. During the time it takes to read and transfer the data in the first sector, the second sector already may have passed the read/write head. Further data transfer is halted until the disk has made a complete rotation and the second sector appears again under the read/write head. Admittedly, this is a small delay since the typical hard disk rotates 60 times a second, but in a computer where time is measured in milliseconds and nanoseconds, it's a costly wait.

To avoid such problems, disks can be set up with varying interleaves. In such cases, as the graphic shows, data is not stored sequentially on the hard disk. One sector is filled; then one or more sectors are skipped before the next segment of data is written.

With a 2:1 interleave, for example, two sectors pass under the read/write head for each sector read. A full 17 sectors can be read with two rotations of the disk. In a slower system, using a 3:1 interleave, sequential data is stored in every third sector.

A hard disk's interleave is programmed in during low-level formatting, which puts down the markers that the operating system uses to keep track of stored data. In many cases, the interleave is set too high in a kind act of conservatism. If a mistake is made, err on the high side rather than the low.

As shown above, the penalty for too low an interleave is that the system must wait one full disk rotation between sector reads. On the other hand, setting the interleave to 3:1 on a system that could handle 1:1 is not as serious. In this case, the controller simply passes over two sectors that it could've read before finding and reading the next sector in the data sequence.

Computer systems built today generally are fast enough to handle 1:1 interleaves, but not all hard disks are formatted that way. If you're concerned that your hard disk isn't transferring information as efficiently as it could, investigate disk-utility software that can analyze and change disk interleaves.

These programs run a series of tests to determine the optimum interleave; then the program reads each disk track into memory, reformats that track with the new interleave, and returns the data to the hard disk in the new, more efficient arrangement. Reinterleaving this way can dramatically improve performance, but for safety, back up your hard disk before you begin.

— TONY ROBERTS

80287, if you have an 80286, or the 80387, if you have an 80386 under the hood.

Math coprocessor prices range from $142 for a 5-MHz 8087 to $994 for a 33-MHz 80387DX. Generally, you need a coprocessor that has a designation matching your CPU (such as the 8087 coprocessor for the 8088 CPU) and that operates at the same speed as your main processor.

Now and then you may become so frustrated with your old PC that you may be tempted to replace the motherboard. Don't fall prey to that temptation. I've had several friends try this, and they always ran into a host of problems. Most typically, they came face to face with extremely odd compatibility problems that no one had ever seen before. They were not happy campers.

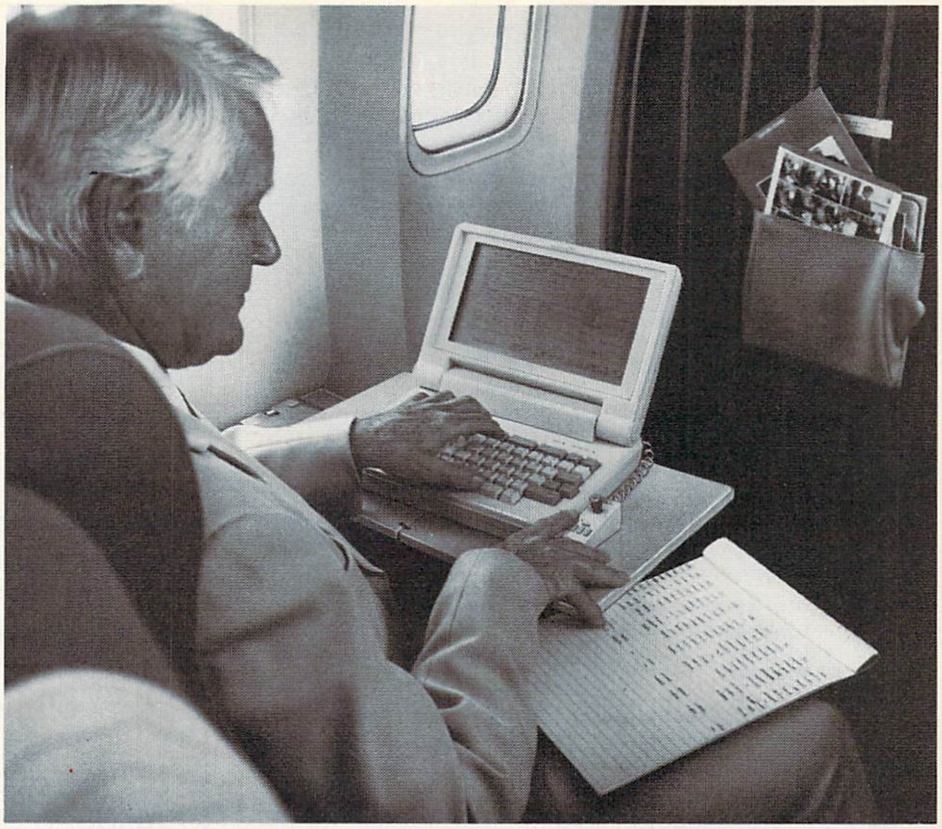
If you're an electronics hobbyist, go ahead and give it a try. Just don't do it expecting to realize big performance gains. You're probably not going to get them. If you're still inclined to try, think about building a computer from pieces instead. You'll have the same kind of fun and a much better chance of having a fast PC when the soldering iron and screwdrivers are put away.

A less drastic alternative is to replace your main processor. There are several accelerator cards that can turn humdrum PCs into tigers. Some of the most popular ones are supplied by Intel: the Inboard series.

Intel has a full range of 80386 boards. The main two are the Inboard 386/AT for AT compatibles and the Inboard 386/PC for PCs, XTs, and XT compatibles. The 386/AT also can be bought with installation kits for the hard-to-fit Tandy and Compaq AT compatibles. These boards replace an AT's 80286 or an older machine's 8088 with a 16-MHz 80386 chip. This won't give you a dramatic boost if you're replacing a modern 12.5-MHz 286, but it will give your system a real kick in the pants if your CPU runs at 10 MHz or less. Installing these boards requires some finesse, but electronics handymen won't find it too much of a problem. You can use the same boards to add an 80387SX to a system, if you need more number-crunching power.

Staying in the Race

As you have seen, there are many ways to put your PC back into the thick of the computer race. Some of them are quite pricey, while others won't cost you a dime. The moral of the story is simple: Not only can you teach an old dog new tricks, but armed with the right tools, you can even make him jump through hoops.▷



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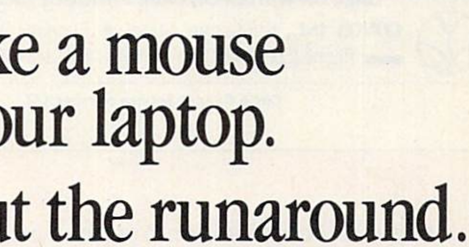

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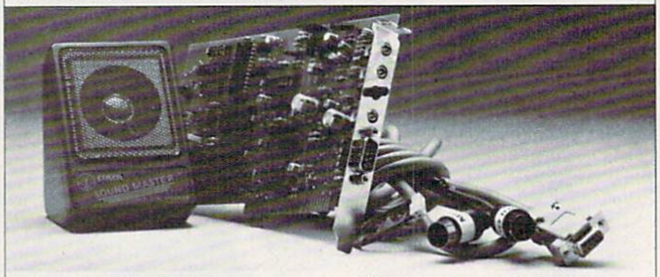

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Performance Shop

Now you know what to do to get the most out of your PC, but where can you find what you need? Most of the products are available through mail order or (if freeware or shareware) on most bulletin boards and commercial online services. List prices are given, but commercial products are frequently discounted. One additional point about shareware needs to be stressed: To ensure the steady flow of high-quality shareware, always register and pay your registration fee.

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ON DISK

FILE MANAGEMENT EMERGENCY REPAIRS AND MORE

TONY ROBERTS

Power users and novices, unite! Here are several super utilities that let you test your system's performance. You can do anything from repairing a disk's file allocation tables to restoring the CMOS memory to your system setup. You can even use these programs to test your floppies to see if there are any system, data, or file errors.

Quick Filer

You'll do a double take when you run this high-quality file-management utility. *Quick Filer* can display two sorted disk directories at the same time; copy, move, and delete files; rename files and directories; view text files with your favorite text lister or editor; and run applications within *Quick Filer.* You can even view, extract, or create archive files utilizing one of the more common archive utilities.

It's one of the few DOS shells with full mouse and EGA/VGA display support. The author is Kenn Flee of Jamestown Software in Madison, Wisconsin, who requests a $20 registration fee.

The program is designed to work on any IBM or compatible PC with DOS 2.1 or higher; however, DOS 3.0 or higher is preferable, since some of the options depend on the presence of DOS 3.0 enhancements. You'll need at least 256K of RAM plus additional memory to run applications from within *Quick Filer.*

GoFile

With *GoFile* it doesn't matter if you remember the exact spelling of the filename or directory that you're looking for as long as you remember part of it. Once *GoFile* finds the file or directory, it either takes you there or gives you a list of all the matches, whichever you prefer.

The utility was written by Justin Langseth of Warwick, Rhode Island. It's a shareware program, and the author has set the registration fee at $15. *GoFile* runs on any IBM or compatible PC with DOS 2.1 or higher.

The Command Line Utilities

For those dyed-in-the-wool command line practitioners, here's a collection of handy utilities written by Erik Skamser of Digital Data Systems that makes issuing DOS commands a little easier.

Two of the utilities, *Move* and *Movesafe,* do what DOS should have done from the beginning; they copy files from one location to another and then delete the original files.

Anyone who uses one or more archiving utilities will appreciate *Extract.* This small but useful utility supports all of the familiar archive formats, such as ARC, ZIP, PAK, SDA, SDN, DWC, LZH, and ZOO. *Extract* knows which compression utility to use to extract the archive file. Of course, the compression utility must be available in the current directory or in a directory specified in your PATH.

The Command Line Utilities requires an IBM or compatible PC with 256K of RAM and DOS 2.1 or higher. The registration fee for the complete package is only $5. The author also offers a disk with the most recent version of all the supported archive utilities for an additional $2.

CMOS

The next time your system won't boot because your CMOS setup information has been trashed or your battery has been disconnected, *CMOS* can save the day. This tiny utility saves a copy of CMOS memory to a file or restores the information in the CMOS memory from a disk file. This can be used to quickly restore the configuration of your machine without your having to remember the pertinent information contained in CMOS.

This public domain utility was written by Alan D. Jones of Farpoint Software in League City, Texas. There's no registration fee, but the author does offer several shareware utilities including *DiskDup* (a disk-duplication program), *DiskEmu* (a DISKCOPY emulator), *TPW* (a password security program), *EPW* (a file-encryption utility), and more. The author requests a small registration fee of $25 for these utilities.

You'll need an IBM or compatible computer, DOS 2.1 or higher, and 256K of RAM to run the program.

FatFix

Don't spend your hard-earned money for a commercial program that fixes the FAT on a trashed disk until you've tried *FatFix—File Allocation Table Manipulation,* a handy utility included on this month's disk. The program was written by Michael A. Hotz of Techniform Industries in Fremont, Ohio.

Working with disks at the sector level is dangerous, especially when dealing with the organizational structures. This program works in two ways. The first option lets *FatFix* repair file allocation tables by letting you copy one FAT to the other and allowing you to create a backup file first. The second option lets you restore the FAT of a disk from a backup file if the program doesn't work as you expected or makes matters worse.

As always, it's best to try this type of program on a floppy disk first. It's nice to know there's a way to repair a

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disk if it gets trashed, but the rule of thumb is always to make a backup of your disks, especially your hard drive. Then if the fix-it program doesn't work, you can reformat and still restore your data. The program requires an IBM or compatible PC, DOS 2.1 or higher, and 256K of RAM.

Interleave Adjustment Utility

Does your computer measure up? Let *IAU* (*Interleave Adjustment Utility*) check the speed of your hard drive and adjust the disk's interleave if it's not working up to its full potential. The program works with most RLL, ESDI, and SCSI drives.

IAU performs a low-level format on the hard drive to adjust the interleave.

The author of *IAU* is Dave Bushong of Dracut, Massachusetts. The program runs on any IBM or compatible PC with a hard drive (it may not work on some hard cards), DOS 2.1 or higher, and 256K of RAM.

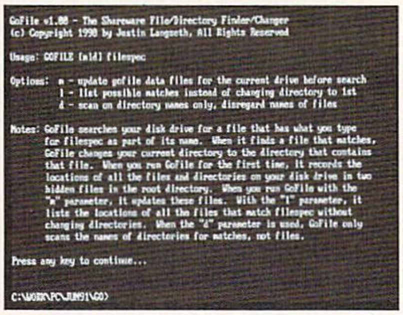
Equiplist and DiskTst

Need system statistics or bad disk sector information? Try *Equiplist* and *DiskTst,* two utilities from *COMPUTE's Productivity Manager* disk. They're yours free of charge. If you'd like to receive 37 more useful utilities and batch-file extensions, you can order the *Productivity Manager* from our Greensboro, North Carolina, address for $14.95 for the 5¼-inch disk or $15.95 for the 3½-inch disk. (See the COMPUTE's Disk Products ad in the Information and Extras menu option when you run *COMPUTE's Menu Operating System* on the disk.)

Equiplist is a tiny utility that displays your computer's system information, including the CPU type and speed, number and type of installed floppy drives and hard drives, installed mouse driver, number of serial and parallel ports, amount of used and available memory, type of monitor, and more.

With *DiskTst,* you never have to waste your time copying files to damaged disks again. The program checks for damage in the system and data areas. Then it checks for disk errors where each file is located.

The programs run on any IBM or compatible PC (*Equiplist* may not work on some Tandys) with DOS 2.1 or higher and 256K of RAM. ◻



```
GoFile v1.00 - The Shareware File/Directory Finder/Changer
(c) Copyright 1990 by Justin Langseth, All Rights Reserved

Usage: GOFILE [mld] filespec

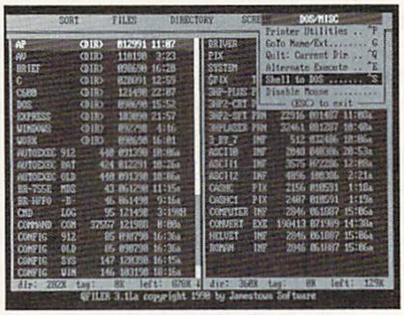
Options:  m - update gofile data files for the current drive before search
          l - list possible matches instead of changing directory to 1st
          d - scan on directory names only, disregard names of files

Notes: GoFile searches your disk drive for a file that has what you type
       for filespec as part of its name.  When it finds a file that matches,
       GoFile changes your current directory to the directory that contains
       that file.  When you run GoFile for the first time, it records the
       locations of all the files and directories on your disk drive in two
       hidden files in the root directory.  When you run GoFile with the
       "m" parameter, it updates these files.  With the "l" parameter, it
       lists the locations of all the files that match filespec without
       changing directories.  When the "d" parameter is used, GoFile only
       scans the names of directories for matches, not files.

Press any key to continue...

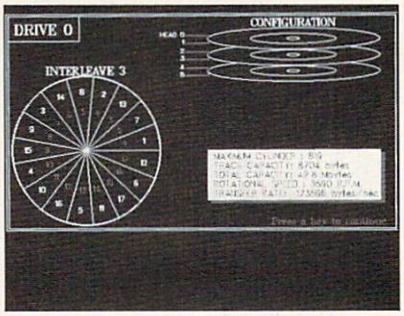
C:\WORK\PC\JUN91\GO>
```

GoFile



```
AP         <DIR>    012991 11:07   DRIVER
AV         <DIR>    110190  3:23   PIX
BRIEF      <DIR>    090690 16:28   SYSTEM
C          <DIR>    020091 12:59   $PIX
C600       <DIR>    121490 22:07   3HP-PLUS
DOS        <DIR>    090690 15:52   3HP2-CRT
EXPRESS    <DIR>    103090 21:57   3HP2-SFT PRN   22916 091487 11:00a
WINDOWS    <DIR>    092790  4:16   3HPLASER PRN   32461 081287 10:40a
WORK       <DIR>    090690 16:01   3_BY_7   INF     512 032486 10:06a
AUTOEXEC 912    440 091390 10:06a  ASCII0   INF    2048 040386 20:53a
AUTOEXEC BAT    424 012291 10:26a  ASCII1   INF    3575 072286 12:08a
AUTOEXEC OLD    440 091390 10:06a  ASCII2   INF    4096 100386  2:21a
BR-7SSE  MDS     43 061290 11:15a  CASHC    PIX    2156 010591  1:18a
BR-HFF0  -B-     46 061490  9:16a  CASHC1   PIX    2487 010591  1:19a
CRD      LOG     95 121490  3:19AH COMPUTER INF    2046 061087 15:06a
COMMAND  COM  37557 121988  0:00a  CONVERT  EXE  190413 071989 14:30a
CONFIG   912     85 090790 16:36a  HELVET   INF    2046 061087 15:06a
CONFIG   OLD     85 090790 16:36a  ROMAN    INF    2046 061087 15:06a
CONFIG   SYS    147 120390 16:15a
CONFIG   WIN    146 103190 10:16a
dir:  282K  tag:    0K  left:  6760K   dir:  360K  tag:   0K  left:  129K
                 QFILER 3.11a copyright 1990 by Jamestown Software
```

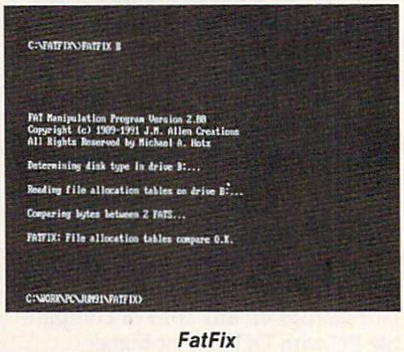
Quick Filer



MAXIMUM CYLINDER : 819
TRACK CAPACITY: 8704 bytes
TOTAL CAPACITY: 42.8 Mbytes
ROTATIONAL SPEED : 3590 R.P.M.
TRANSFER RATE: 123598 bytes/sec

Press a key to continue

Interleave Adjustment Utility



```
C:\FATFIX\>FATFIX B



FAT Manipulation Program Version 2.00
Copyright (c) 1989-1991 J.M. Allen Creations
All Rights Reserved by Michael A. Hotz

Determining disk type in drive B:...

Reading file allocation tables on drive B:...

Comparing bytes between 2 FATS...

FATFIX: File allocation tables compare O.K.



C:\WORK\PC\JUN91\FATFIX>
```

FatFix

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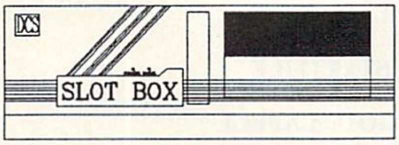

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TIPS & TOOLS

HINTS AND TIPS FROM OUR READERS

When using *PageMaker* for the PC, most users know they can view their work at 200-percent size by selecting 200% from the Page menu or by pressing Ctrl-2. Since there's no menu option for 400 percent, most users don't realize that a 400-percent view is available. Try pressing Shift-Ctrl-2 to really zoom in on the fine points of your document.

Tony Roberts
Greensboro, NC

Viral Warfare

Many folks are worried about viruses these days (the computer variety, not the common cold). Here's a tip that'll keep some of the bad guys away.

Most viruses inhabit programs (COM and EXE files). They reside on an area of the disk called the boot sector. Of the five most common viruses in North America, three are boot-sector infectors.

The only way you can catch a boot-infector virus is to boot from an infected disk. You can't get it from a bulletin board, and you can't even get it by running programs on that floppy disk. You've got to boot from the infected disk. How often do you boot from a floppy disk? Almost never, if you've got a hard disk.

But how often do you put a floppy in drive A to read some data and leave the floppy drive door closed? Almost always, if you're like most of us. That's when the virus zaps you. You reboot your system, not realizing that you've left the floppy in drive A with the door closed. You see the *disk boot failure* message, realize that you've accidentally tried to boot from a nonbootable floppy, and pop the door open and reboot.

But if the nonbootable floppy had a boot-sector infector on it, your hard disk is now infected. This is the way that virtually all of the boot-sector infectors spread.

Get in the habit of opening the floppy drive door as soon as you're finished reading from it.

Mark Minasi
Arlington, VA

Fuel-Efficient Batch Files

Sometimes the speed of a batch file is important. For example, on older, slower hard disk systems or floppy-only systems such as laptops, you want your batch files to be as streamlined as possible. Very large or medium-size but poorly written batch files can try anyone's patience, regardless of the speed or capabilities of the machine. Following are a few tips for trimming every last second you can off a batch file's runtime.

- Replace all of your REMs with colons. Since each line must be reinterpreted as a batch file runs, it takes a bit longer to recognize REM than a single colon. Plus, this method gives you a way to include nondisplayed comments without including @ECHO OFF.

SUPERCHARGING BATCH FILES
AND LOTS MORE

- Start with @ECHO OFF. Displaying redirectable text (as all batch files do) is an incredibly inefficient process—all the more reason to get that @ECHO OFF (or just ECHO OFF in DOS versions previous to DOS 3.3).

- Put often-used labels close to the top of a file. An innocent-looking line like GOTO TOP can be the worst offender. Batch files are read into memory one line at a time. A GOTO causes the batch interpreter to go back to the start of the file and search each line for a label called TOP. If TOP is on line 1000, 999 lines will be read every time the GOTO TOP statement is encountered. Instead, your batch file should be structured like this:

```
: Skip the area most often needed
    by GOTO labels.
GOTO STARTFILE
:LABEL1
...
:LABEL2
...
:STARTFILE
...
GOTO LABEL1
...
GOTO LABEL2
```

- Break a large batch file into smaller, more manageable units. A batch file of more than 200 lines is probably too long. If you have excessive GOTOs and IFs in such a file, you might be able to remove them by breaking the file up into several smaller files. Ideally, these files should have no more than 50 lines each.

- Create a RAM disk. You probably know already that a RAM disk speeds things up. Before scoffing at an expensive hardware solution, recall that many programs, such as VDISK, can work on that underused 384K above 640K on your AT. There's nothing wrong with a RAM disk just large enough to hold a slow batch file.

- Avoid COMMAND/C, used on DOS version 3.2 and earlier, and replace it with the newer CALL command. These are the commands used to execute one batch file from within another. Command returns to the calling batch file at the line after the CALL command.

Tom Campbell
Irvine, CA ◻

PROGRAMMING POWER

MOVE OVER MICROSOFT

HERE'S POWER BASIC

TOM CAMPBELL

QuickBASIC isn't the only game in town, you know. There's an old new kid on the block, *PowerBASIC* 2.0, formerly *Turbo Basic,* and it merits the name. *PowerBASIC* is powerful in ways that its Microsoft rival doesn't even begin to touch. *Turbo Basic* was released several years ago, then hung up to dry by Borland. While *QuickBASIC* was upgraded constantly—and with fabulous success—*Turbo Basic* was a forgotten stepchild.

Borland finally returned *Turbo Basic* to its original developer, Bob Zale (who formed Spectra Publishing in mid 1990); released what was to have been *Turbo Basic* version 2; and renamed it *PowerBASIC* 2.0.

It's a killer product. Faster than the *QuickBASIC* native-code compiler, blessed with some incredible array-handling features and unheard-of accuracy in its multitude of numeric formats, and sporting dozens more keywords than *QuickBASIC, PowerBASIC* is a real contender.

PowerBASIC has a ton of hot new features. My favorites are the new array features, which let you sort arrays of numbers or strings in a single instruction far faster than if you wrote a quick sort routine; the communications support, which raises the ceiling from DOS's poky 9,600 bps all the way up to 115,000 bps; units, which act somewhat like OBJ modules but with error checking and much greater speed; and USING$, which lets you format strings as if you were running them through PRINT USING, copying the output to a string variable instead of the screen. Much easier to use than C's sprintf( ) but serving the same purpose, USING$ saves a lot of code in screen-intensive applications.

A state-of-the-art source debugger finally eliminates all those ugly PRINT statements you've been inserting in questionable areas of your programs. Conditional compilation, like C's $ifdef, lets you maintain several different versions of your program in the same file.

PEEK and POKE are cleverly extended to let you peek and poke strings (you can move whole screens with one instruction) and all types of numbers. Strings can fill all of memory, not *QuickBASIC's* paltry 60K, and they can be up to 32K long each.

High Finance

An incredibly comprehensive variety of numeric formats and calculation routines brings *PowerBASIC* well to the fore of BASICs for the PC, making it by far the best choice for financial calculations and those requiring high precision for scientific and engineering uses.

Round-off errors and low precision have always plagued computer users, resulting in frequent "that's not what I really meant" situations where accumulated round-off errors introduced by such innocent-seeming calculations as "⅓ of 100 expressed as a decimal value" can cause severe errors in a small number of repetitions.

You can choose 80*x*87 coprocessor support for top speed on those systems with a numeric coprocessor; emulation of the coprocessor on systems without it, a slower option but one that produces results identical to those on coprocessor-equipped systems; or procedural math, which runs faster than 80*x*87 emulation.

The 80-bit extended precision values far outstrip the 64-bit "currency" type in Microsoft's $500 *BASIC* 7.0, and there's nothing at all like it in *QuickBASIC.* It also appears to be much faster than *BASIC* 7.0 or *QuickBASIC* in arithmetic calculations.

I have a few nits to pick, but they're strictly with the integrated environment. While the online help is markedly improved from *Turbo Basic,* it needs examples and more *See also* links. The help system in general is a bit antiquated, although it would've been the cat's pajamas three years ago. The language itself, however, is a breathtaking achievement. I can't wait to see version 3, but I'm in no rush—the horde of new features in this version will keep me happy for a long time.

This month's program is called *J* for Jump. It's a shortcut for the CD command when you'd like to change to a directory on the path, even a directory on another drive. To use it, just enter

J *partialsubdirectory*

where *partialsubdirectory* is any sequence of letters that will identify the directory (which must be one of the directories on your PATH) uniquely. It can be any contiguous sequence of letters appearing anywhere in the name. For example, if your path is

```
PATH=C:\BIN;C:\DOS;C:
  \BAT;C:\WORD5;C:\TC
  \BIN;C:\PCTOOLS;
```

you can get to the WORD directory with the command J 5 because only one directory in the path has a 5 in it. You could jump to the C:\PCTOOLS directory—even from a drive other than C—with the command J P because it's the only directory on the PATH with a *P* in it. So if you're in the D: \BUILDER directory and use the command J P, you're getting to the same place you'd otherwise have to type this to get to.

C:
CD \PCTOOLS

If no directory on the path matches the name on the command line (that is, forms a superset of the set of characters on the command line), *J* prints a message saying so and quits, setting ERRORLEVEL to 1. Likewise, if you neglect to follow *J* with a partial directory name, you'll get an error message.

This month's program illustrates two unique *PowerBASIC* features, ChDrive( ) and local variables.

When J.BAS finds a directory matching your input and the directory contains a colon in position 2, J.BAS uses ChDrive( ) to log on to that drive. More interesting is the ParsePath$ function. ParsePath$ is given a string in the form of a PATH statement and an integer variable to track the current position in the string. It builds a directory name in the variable PPath$, then uses that as the return value.

Note that the variables PPath$, NextPos%, and NextChar$ are declared as local variables. Local variables can only be used inside the SUBs or FUNCTIONs in which they're declared. Long a principle in other programming languages such as Pascal and C, local variables serve an extremely important purpose; they let you form an airtight seal around variables used only in one routine. That way they can't get changed accidentally by other routines that happen to use the same name—any number of other SUBs and FUNCTIONs can use these same names without affecting those inside ParsePath$( ).

Because the only publicly visible variables ParsePath$( ) can change are its parameters, ParsePath$( ) is what's known as a reentrant routine. Even though the use of locals is one of the cornerstones of good programming, they're not available in all versions of compiled BASIC. Type LOCAL in the *QuickBASIC* environment, for example, and then press F1. All you'll get is the message *The LOCAL keyword is reserved for future use.* Well, the future is now with *PowerBASIC.*

```
' Compiled using PowerBASIC 2.10a
'
' J lets you jump to any directory specified on the path by entering
' J and just a few identifying letters of the directory name. For
' example, if you have a path that looks like this:
'
'   PATH=C:\DOS3;C:\POWERBAS;D:\BLDSRC\SRCT
'
' You can go to the BLDSRC drive and directory with the command
' line
'
'  J BL
'
' Force the command line to uppercase.
Match$ = Ucase$(Command$)
' Make sure there's a directory on the command line.
If Match$ = "" Then Call Quit ("Missing a directory. Example: J DOS", 1)
Path$ = environ$("PATH")
' Make sure there's a PATH in the environment.
If Path$ = "" Then Call Quit ("No PATH specified in your environment", 1)
' Position tracks our place in the PATH string returned by Environ$().
Position% = 1
' This is an endless loop, since terminating conditions are met
' inside it and all possibilities are handled by the Quit routine,
' which exits back to DOS.
do
  ' Copy the next semicolon-delimited directory name into NextDir$.
  NextDir$ = ParsePath$(Path$, Position%)
  ' If a null string is returned, the program was unable to make a match.
  If NextDir$ = "" then Call Quit ("Can't find "+Match$, 1)
  If InStr(NextDir$, Match$) Then
    ' Match$ has been found within NextDir$. Change to the drive specified
    ' by NextDir$, if a drive is named.  The Mid$() function looks at 1
    ' character in position 2 of the string--this is how we determine
    ' if there's a drive specification.
    If Mid$(NextDir$, 2, 1) = ":" Then
      ' Found a drive. The ChDrive() function lets us change to a drive
      ' without requiring a colon following the drive specification.
      ChDrive(Left$(NextDir$, 1))
      ' Strip off the drive designator and colon.
      NextDir$ = Right$(NextDir$, Len(NextDir$)-2)
    end if
    ' Strip off any trailing semicolon.
    If Right$(NextDir$, 1) = ";" Then
      NextDir$ = Left$(NextDir$, Len(NextDir$)-1)
    End if
    ' The drive specification and the trailing semicolon, if any, have
    ' been removed.  We have changed to the proper drive.  Now let's
    ' change to the directory.
    ChDir NextDir$
    ' Exit to DOS with an ERRORLEVEL of 0, meaning everything's fine.
    Call Quit("", 0)
  end if
loop

' ParsePath$ returns the next directory in the PATH by copying all the
' characters up to the next semicolon into the return value. Position%
' keeps track of the position in the string.
Function ParsePath$(InPath$, Position%)
  ' LOCAL variables trim code size and make code more maintainable.
  ' Making them local means they can't be used (or tampered with)
  ' outside of this routine.
  Local NextChar$, NextPos%, PPath$
  ' Get the next character from the path.
  NextChar$ = Mid$(InPath$, Position%, 1)
  ' Collect characters until a delimiter (";") or end of string occurs.
  While NextChar$ <> ";" and NextChar$ <> ""
    NextChar$ = Mid$(InPath$, Position%, 1)
    ' Add the next character to the return value.
    PPath$ = PPath$ + NextChar$
    ' Keep track of where we are in the PATH variable.
    Position% = Position% + 1
  Wend
  ' The string we've collected becomes the return value.
  ParsePath$ = PPath$
End Function

' The Quit() routine returns to DOS, printing Msg$ and setting
' the ERRORLEVEL to ErrorCode%. All exits from the program go through
' Quit().
Sub Quit(Msg$, ErrorCode%)
  ' Display the error message (or nothing, if the message is "").
  Print Msg$
  ' Exit to DOS, setting ERRORLEVEL appropriately.  By convention,
  ' an ERRORLEVEL of 0 means no error occurred, and 1 or more means
  ' something went wrong.
  End(ErrorCode%)
End Sub
```

HARDWARE CLINIC

KEEP YOUR POWER CLEAN AND PURE

MARK MINASI

PCs are big investments for homes or small businesses, so protecting that investment is important. The single biggest environmental threat to your PC comes from the very electric power that the machine needs to survive. Worse yet, power troubles don't come right out and announce themselves; they arrive in the guise of other problems. It's often hard to catch power problems in the act.

Have you ever experienced the following?

- A hardware problem that seems to jump around? One day it's memory, the next the disk, but it isn't repeated.
- A memory error that comes and goes?
- A PC that occasionally freezes up for no reason?

One of the most likely causes of these problems is either bad power itself or a bad power supply.

Surge of Power

AC power seems a fairly reliable thing; it keeps TVs, toasters, lamps, and the like running almost 100 percent of the time—at least in most of the U.S. And, it seems, one outlet's as good as any other. That toaster works just as well in the outlet on one side of the kitchen as in the outlet on the other side of the kitchen.

PCs *should* be as robust in their power needs, but they aren't, sadly. Like all other computers, PCs have a fairly refined taste when it comes to electricity. You see, your PC needs power the way you and I need air; it'll die quickly without it, and if it's dirty, performance will suffer.

Problems with power fall into three categories: power surges, low voltage (brownouts), and no power (blackouts).

First, consider power surges. Surges come and go in a millisecond. You don't see them, they don't make the lights flicker, nor do they make the toaster burn your breakfast. They're too brief for any of those things. But every one of those zaps can damage chips in your PC.

Your PC's chips are composed of silicon crystals; crystals are highly organized molecules, groups of atoms frozen into a particular pattern. Add some unwanted energy—a power surge, in this case—and a few atoms fall out of place.

Once that happens, the chip's effectiveness is diminished somewhat because the fallen atoms generally *remain* out of place. This isn't always true, however. Some chips are self-healing to a certain extent, but much of this damage is cumulative. One day, you'll get that final zap that pushes the last critical atom out of place, and your PC is history.

What can you do about power surges? There are three things: Buy power protection equipment, check that you're not causing any surges in your office or home, and leave the computer on all the time.

Don't Turn Your PC Off!

"What?" I hear you saying. "Leave the computer on *all the time?*" Yes, it sounds odd, but there are good reasons for it. Every time you turn on an electronic device, it experiences a momentary inrush current, a temporary surge of four to six times the usual current.

More specifically, the average PC system unit normally draws around 60–80 watts of power. Such a PC would see a brief surge of up to a half kilowatt of power, not a plan for PC happiness. (You can find out more about this in *PC Power Protection,* by Mark Waller, published by Howard Sams in 1989. It's a bit techie, so some of it is rough sledding, but it's packed full of power facts and worth picking up.)

Some people explain it this way: When do light bulbs most often burn out? Answer: When they're first turned on. That's a bit of an oversimplification, but the general rule is that electronic devices, PCs included, are happiest when left on all the time. Some of the most reliable electronic things in your house are left on all the time, including the thermostat that controls your house's temperature, electric clocks, and TVs. (*TVs?* Yes. Part of your TV is active all the time, like the part that responds to the remote.)

That's why I say to leave your PCs on 24 hours a day, seven days a week. We've done it at my company for years. Just leave the system unit on and turn the monitor off, turn the screen intensity down, or use one of those annoying automatic screen blankers so the monitor doesn't get an image burned into it. Turn the printer off, also.

Now, not all of you will be convinced to leave your machines on 24 hours a day. But here's a related tip that *everyone* should heed. I see lots of users who plug everything into their surge protector, then use the surge protector's on/off switch as a kind of master on/off switch for the PC and peripherals.

This has the unfortunate effect of causing all the power-on surges from the monitor, PC, and printer to happen *at the same time,* a worse situation than powering them up separately.▷

To remedy that, some companies sell so-called power directors, those slim boxes that sit above the system unit and below the monitor. They cause a very short delay between the monitor power-up, printer power-up, and system unit power-up, so their surges don't interact.

Of the reasons to leave your computer on all the time, perhaps the most compelling is to protect your hard disk. One important component of your hard disk is the rotational motor, the motor that keeps the disk spinning at exactly 3600 rpm. You know from real life that it's a lot harder to *start* something moving than it is to *keep* it moving. (Ever push a car?)

Similarly, the rotational motor finds it much easier to keep the disk spinning than to start it spinning. When a hard disk won't start spinning on power-up, it's called *stiction,* and it's one cause of drive failure.

And there's another reason why you should keep the power on, as far as the hard disk is concerned. The initial power surge runs through *everything,* including the hard disk head. Let's suppose you don't park your hard disk head, so the head just ends up wherever it was when you turned the machine off. Now the surge goes through the head. It ends up blasting the data that happens to be sitting under the head with a "Bleahhh!" The surge blurs the data under the head. Obviously, autopark drives don't have this problem.

I know—you're having trouble believing that your drive's motor is happier working without a rest. But consider this: Do hard drives tend to fail more upon startup or at some random point during the day? Most failures that I've seen happen upon startup or boot time. Leaving the disk spinning avoids those troubles.

All of this advice is only useful, by the way, *if* (1) your machine remains fairly cool, 80 degrees or below, (2) you have fairly reliable power (there's no sense trying to leave your computer on all the time if you're going to end up losing power once a day anyway), and (3) you have decent surge protection—the next topic.

Shielding from Surges

Surges are caused either by noise on the power lines or by other devices on your power circuits. For example, copy machines feed a fair bit of noise into the system; so do power tools and big motors, like the ones you see in refrigerator or air conditioner compressors.

That means that surges occur on a daily or, in some sites, an hourly basis. If the PC's power isn't properly isolated, it'll see surges every time the coffee maker, refrigerator, copier, or any other large power drain comes online.

Since we can't see surges, we tend not to be aware of just how common they are. So special devices have been invented that will monitor surges and report on their frequency of appearance. Such power line monitors cost a pile of money—some can run $15,000 or more.

Most of us can't afford that, of course, but there's a much cheaper power line monitor from Tasco (2875 West Oxford Avenue, #5, Englewood, Colorado 80110; 303-762-9952; $130). Called the AC Line Monitor, it plugs into any power outlet. Lights indicate the voltage level being delivered at the moment, as well as surges. Since surges don't last too long, the surge light comes on after a surge and stays on until you push the reset button. The monitor even makes an annoying buzz when a surge happens.

Once you've seen how common surges are, what can you do about them? Three approaches to surge protection are seen in the industry today:

- Inexpensive surge protectors use one-shot, kamikaze components to protect you from a single surge.
- Transformer-based systems are a bit more expensive but are reusable.
- Uninterruptible Power Supplies (UPSs) break down the power, eliminate the surges, and reform the power into textbook clean AC power.

Many of us have six-outlet power strips that are sold as surge protectors, costing from $20 to $100. Surge protectors are built around a device called a *Metal Oxide Varistor,* or MOV. A MOV is a device that can shield your PC from quite a lot of unwanted power for a fairly low price. But when it reaches its limit, it essentially disappears from the circuit—it affords no surge protection once it's dead—and allows the surges to pass right on through to the PC.

That's the troublesome part about a surge protector: It dies eventually, and there's no easy way to find out when it's dead. Many of you reading this article may have surge protectors that are totally useless. There are some surge protectors that have a light on them that indicates whether the surge protector is still working or not. Surely this is enough surge protector insurance? Sadly, it isn't. When the light is out, the surge protector is surely dead. But if the light's still on, the surge protector *could* be useless.

It's amazing that so many surge protectors are sold when they provide such ephemeral protection, but there's a good reason. They're inexpensive, and nobody bothers to explain to consumers exactly what they are—or *are not*—buying.

Maybe that's why *power conditioners* aren't very well known, even though they're probably your best buy in power protection devices. A power conditioner is built around a transformer, and a transformer will, among other things, absorb an essentially unlimited number of surges. A power conditioner will additionally adjust your AC voltage up or down to compensate for variations in the power that your local power utility is providing. Why is this important? Well, where I live, for example, the local utility has some trouble providing a full 120 volts in the middle of summer, when electric demand is at its peak. So it compensates by dropping the voltage to 110 or 115 volts. I know when this happens because the power conditioner under my desk clicks when the input voltage changes. My PC's got nothing to worry about, however, because the power conditioner automatically steps the voltage back up to 120.

That's the beauty of power conditioners; they protect you from surges *and* low voltage all in one package. The bad news is the price. They're about three times the price of a surge protector. One good power conditioner, for example, is the Tripp Lite LC1200 (Tripp Lite, 500 North Orleans, Chicago, Illinois 60610; 312-329-1777; $249), which can be found discounted at around $150.

A power conditioner protects you from the first two power problems, surges and low voltage. But what about the third—*no* voltage, a blackout? That's for next month.

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POINT & CLICK

CLIFTON KARNES

That clicking sound you hear isn't a mouse button. No, it's chattering teeth, and it's coming from the makers of *Quattro Pro, Lotus 1-2-3,* and *Wingz.* Why are these guys so scared? *Microsoft Excel* 3.0 (Microsoft, One Microsoft Way, Redmond, Washington 98052-6399; 206-882-8080; $495).

Excel 3.0 is Microsoft's latest entry in the spreadsheet wars that seem to get hotter each year. For this new release, *Excel* has been entirely revamped, and while it certainly has new power, the topper is that it's now much easier to use. In fact, it's the easiest-to-use spreadsheet on the planet.

When you fire up *Excel* for the first time, you'll see one of its neatest new features—the toolbar, an idea borrowed from *Word for Windows.* The toolbar is a horizontal bar that rests under the menus and contains several groups of push buttons. The push buttons are primarily shortcuts for commonly used commands.

Let's take a quick look at the toolbar to get an idea of what it offers and to get a feel for some of 3.0's new features. Going from left to right, the toolbar has buttons for styles, promoting and demoting outline elements, autosumming (which automatically sums rows or columns), bold and italics, alignment, selecting graphics objects, drawing (including line, rectangle, ellipse, and curve shapes), autocharting, creating text boxes, creating user-defined buttons, and recording macros.

One of these buttons, autosum, is especially useful. Because adding figures in rows or columns is the most common spreadsheet task, Microsoft created a special function to make this easier. To use autosum, place your cursor at the end of a column or row (where you want the total to go) and click on the autosum button. The program will place the SUM formula in the current cell and select the range for you. Autosum almost always chooses the right range for the sum, but when it doesn't, you can simply compress or extend the selection.

There are two other excellent new timesavers that bear quick mention. The first is *Excel's* automatic best-fit feature for column width. To use this, you place the pointer between two cells and double-click. The program adjusts the width of the column on the left and makes a best fit for the data therein. Another timesaver lets you double-click on any cell that contains a note (these are identified by a small red dot in the upper right corner) to display the note's text.

The new *Excel* is hip to fonts. Unlike version 2.0, which was limited to four fonts per work sheet, 3.0 allows you unlimited access to your system's typefaces. And to make it easier to work with fonts, the program now offers style control. You can access styles with the style combo box on the toolbar. To define a style, select an area of your work sheet and format it with the font (you can specify bold, italics, underline, or strikeout) and point size. Click on the style box and type in the name for your new style. From then on, the style will appear on your style combo box menu.

WHAT MAKES
EXCEL SO SCARY?

There's no question that this version of *Excel* is dramatically easier to use, but there are several important new power features, too. The most welcome is outlining. Outlining lets you structure your spreadsheet in a hierarchy, and more importantly, you can display selected parts of the spreadsheet based on that hierarchy. After using outlining, it seems like such a natural feature that I'm amazed it's taken this long for spreadsheet outlining to make it into a product.

To get a feel for how outlining works, let's say you're working on a balance sheet with several subtotals, each based on 25 to 50 items. By the time you've finished with the work sheet, it could easily contain 300–400 rows of figures, much too long to see the major divisions of your expenditures. The solution is simple with outlining. Select the range of figures that comprise each subtotal and demote them with the right-pointing arrow on the toolbar. You'll see a small "–" button and a line indicating the outline range of the button. Click on the button (which will change to a "+"), and your range will be hidden. Click on the "+" button to display the range again.

"It's better to look good than to feel good," says Billy Crystal, playing the host of "Fernando's Hideaway" on "Saturday Night Live," but it's best to look good *and* to feel good. While *Excel* certainly feels good, version 3.0 looks good, too. And one place it looks good is charts. In addition to the standard chart fare, the program now boasts eye-popping 3-D area, column, line, and pie charts. And you have complete control over your chart's rotation, perspective, and color. The only problem with these gorgeous graphs is that you can't export them to a standard vector format that service bureaus will accept.

The only major module of *Excel* not to undergo a full revamping was the database. To bolster this area, Microsoft has bundled *Q+E,* a database front end, with *Excel* 3.0. With *Q+E,* you can import *Excel, dBase,* and text files; edit them; and perform SQL queries. *Q+E* is an impressive database program in its own right, and combined with *Excel,* it's a powerhouse. ☐

INTRODOS

OUT OF ROOM? IT'S TIME TO SEND FILES PACKING

TONY ROBERTS

No matter whether your system runs from a hard disk or floppies, disk real estate is always a precious commodity. There's never enough room, and there never will be. Computer users must continually cull unneeded files from the disk, and the first place to look should be your DOS subdirectory. Although it's possible to gain a fair amount of space by eliminating DOS files from disks, few make this move for fear of erasing something important.

The basic rule to follow in weeding out DOS files is that if you don't use it, you should lose it. Keep programs that are referenced in your CONFIG.SYS and AUTOEXEC.BAT files, keep files required by application programs, and keep programs you run regularly from the DOS prompt, such as CHKDSK and FORMAT.

Bear in mind, though, that most of the commands you type at the DOS prompt—instructions such as DIR, DEL, COPY, CHDIR, CLS, DATE, and TIME—are not kept in separate files. These commands, which are called *internal commands*, are all part of the system's command processor, COMMAND.COM.

Here are some general guidelines for what to keep and what to pitch. Don't be overly concerned about making a mistake. You're only deleting files from your *working disks*. If you learn later that you need a certain file, it's a simple matter to go back to your DOS masters and copy that file to your working disk.

Without a doubt, keep these files: CHKDSK.COM, COMMAND.COM, DISKCOPY.COM, FORMAT.COM, MODE.COM, SYS.COM, and XCOPY.EXE.

If you use a hard disk, keep FDISK.COM, FASTOPEN.EXE, BACKUP.COM, and RESTORE .COM. Most hard disk users, however, prefer commercial disk backup programs to the BACKUP and RESTORE commands offered by DOS. If you use such a commercial program, send BACKUP.COM and RESTORE.COM to the showers.

Files such as ANSI.SYS, DRIVER.SYS, RAMDRIVE.SYS, and SHARE.EXE may be needed for certain configurations. Generally, these files will be put into play by the system startup files. Check CONFIG.SYS and AUTOEXEC.BAT and keep the files your system needs.

Just these few files will keep 90 percent of computer users working smoothly and happily. The rest of the programs included with DOS are either designed for a specific need or have outlived their usefulness and are included with new DOS releases mainly for the sake of continuity and compatibility with older versions.

Consider the special tasks your system performs and retain only the files that will help you accomplish your goals. For example, programmers may need to use GWBASIC .EXE, DEBUG.COM, EXE2BIN .EXE, MEM.EXE, and LINK.COM, but others can safely eliminate those files. Another whole set of programs and files that can be eliminated consists of those that support code page switching, the process of switching in and out character sets for different foreign languages.

Since most of us live and work in the United States, we can ignore code page switching and all of its attendant files: COUNTRY.SYS, DISPLAY .SYS, GRAFTABL.COM, KEYB .COM, NLSFUNC.EXE, KEYBOARD.SYS, PRINTER.SYS, SELECT.COM, and any file using the CPI extension.

Among the files you may or may not want to keep on disk are the three DOS filters—FIND.EXE, MORE .COM, and SORT.EXE. These programs perform valuable functions, but their usefulness has been eclipsed by increasingly powerful application and utility programs.

The files ASSIGN.COM, JOIN .EXE, and SUBST.EXE are DOS's "smoke and mirrors" commands. With the command ASSIGN A B, you tell the system to access drive B any time any program or user asks for drive A. SUBST allows you to define a shorthand name for a long pathname. These commands come in handy when you have a specific problem, but few computer users have a compelling need for them.

There are several files you may be better off without. RECOVER .COM is designed to help pull data off bad disks, but it has a reputation for making matters worse. EDLIN.COM is a terrible line-based text editor. TREE.COM attempts to show your disk's directory structure. PRINT .COM was handy years ago, but today's applications software has assumed the burden of printing and does a better job.

COMP.COM and DISKCOMP .COM compare files and disks to make sure they're identical. If you do need to compare files, use FC.EXE. GRAPHICS.COM is a memory-resident utility that must be loaded to print hardcopies of graphics screens. Some older software needs this support, but today's applications generally handle these details themselves.

LABEL.COM lets you assign an 11-character name to your disks, but most people simply label their disks when they format them.

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ARTS&LETTERS

WHY WINDOWS ISN'T THE ONLY GAME IN TOWN

ROBERT BIXBY

Last time, after grousing a bit about the many shortcomings of *Windows,* I left off with the teaser that this month we would talk about graphics programs that don't run under *Windows* and, consequently, don't require waiting. The good news is that these programs are all faster than *Windows.* The better news is that a couple of the items discussed here are parts of operating system shells shipped with certain brands of computers, so you may already have the software.

To begin with, the creators of *WordPerfect* are always trying to repeat the magic in other areas of computing. Whether or not they have succeeded with *DrawPerfect* (WordPerfect, 1555 North Technology Way, Orem, Utah 84057; 801-225-5000; $495) is up to the marketplace to decide. However, it is a quick, responsive package that comes packed with a collection of superior clip art.

If you're interested in using graphics with *WordPerfect, DrawPerfect* is perfect for you. Not content to create an adjunct to the most popular DOS word processor in the world, *DrawPerfect's* originators created a presentation package that can be used to create either stand-alone computer-driven slide shows or graphics to be used within documents. A *Windows* version of *DrawPerfect* is planned by the end of the year, but the company will continue to manufacture and support the DOS version.

Harvard Graphics from Software Publishing (1901 Landing Drive, Mountain View, California 94043; 415-962-8910; $495) is primarily a graphing program, but it contains a good drawing module. Unfortunately, the interface is about as confusing as it can be, and many users are stumped when it comes to moving an object on the drawing screen. Clip art seems to be permanently anchored in place unless you can find or figure out the extremely nonintuitive method *Harvard Graphics* uses to "unstick" it—pressing the backspace key.

AutoSketch (Generic Software, 11911 North Creek Parkway South, Bothell, Washington 98011; 800-223-2521; $249) is a very capable tool for drafting. Its latest release is inexpensive, and clip-art libraries are only about $50 each, list.

GeoDraw is a simple drawing program that comes with *GeoWorks Ensemble* (GeoWorks, 2150 Shattuck Avenue, Berkeley, California 94704; 415-644-0883; $199.99). In its original release *GeoDraw* doesn't support curves (other than ellipses), but the *GEOS* operating system does support 24-bit color (for 16.7 million potential colors) and is fully object-oriented.

If anyone would be expected to have a high-powered alternative to *Windows* graphics packages, it's Digital Research (DRI), whose thunder was stolen early in the game when Microsoft (creator of *Windows*) released a jazzed-up version of the CP/M operating system for the PC and called it MS-DOS, which essentially wiped out DRI's CP/M.

DRI has come through with *Artline* 2.0 (Digital Research, 70 Garden Court, Monterey, California 93942; 408-649-3896; $595), which runs under a version of runtime *GEM.*

GEM stands for Graphics Environment Manager. It was an early alternative to *Windows* that never achieved the same level of popularity. *GEM* is known principally as the operating system shell for *Ventura Publisher* version 2.0 and earlier (the current *Ventura* release also has a *GEM* version).

Artline's kinship to *Ventura Publisher* 2.0, one of the most popular high-end desktop publishing products, is a recommendation.

There has been an update of *GEM* graphics files since the release of *Ventura,* so you will have to upgrade the software to use bitmap graphics from *Artline.* (The software for this upgrade is included with *Artline,* so this is no problem.) Encapsulated PostScript files from *Artline* can be used without upgrading *Ventura,* however.

The original *Artline* was a fine drawing program but little more than that. The current version, by contrast, is at the forefront of the industry in terms of features. It's comparable to *Corel Draw, Micrografx Designer,* and *Arts & Letters Graphic Editor.*

What features can you expect? Start with blends (gradual transformations from one shape to another), autotrace, text-along-path, node editing, and fountains. *Artline* can also create masks and merges, which play tricks with outlines.

Artline has full text capabilities, featuring a wide range of typefaces in sizes from 2 to 500 points. *GEM* has selector box settings, which are slightly different from *Windows',* that allow you to enter a value in a text box by sliding a bar up and down a scale with the mouse. This is more efficient than the up and down arrows *Windows* typically uses for this purpose.

There are some drawbacks with *Artline. GEM* isn't multitasking, so you have to wait for *Artline* to complete its entire drawing before you can proceed after a screen refresh. Fortunately, the view menu allows you to turn off fountains, eliminating one of the most time-consuming redraws. ⊡

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☐ **ViruScan (1440)** - Make sure your computer is virus-free with this valuable utility. Highly recommended!

☐ **Tree View (1418)** - A superior DOS command shell with pull-down menus.

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☐ **On Side (1506)** - Prints your spreadsheets (or any file) sideways.

☐ **As-Easy-As (1805)** - A fantastic Lotus 1-2-3 compatible spreadsheet.

☐ **Lotus Learning Sys. (1810,1811)** A complete package that makes it easy to learn Lotus 1-2-3. (2 disks) HD

MS WINDOWS 3.0

These programs require Windows 3.0.

☐ **Almanac (1470)** - An excellent calendar/information utility.

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☐ **Topp's Grocery Program (1136)** - Helps you prepare grocery lists, manage coupons, and track savings. HD

WORD PROCESSING

☐ **WP 5.0/5.1 Clip Art (1875,1876)** - A large collection of clip art to add spice to your WP documents. (2 disks)

☐ **PC Write 3.03 (1851-1853)** - A very popular full-featured word processor. (3 disks) HD, 512K

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☐ **Readability Plus (1340)** - A computerized writing style analyzer.

☐ **Grab Plus/Laser Label (1883, 1884)** Takes addresses from a word processor and sends them to the printer. HD

APPLICATIONS

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☐ **PC Beat (1909)** - Turns your computer into a drum machine. A lot of fun!

☐ **Calendar Mate (1344)** - A full-featured program designed to create personalized calendars.

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☐ **By the Numbers (1342)** - Provides you with a complete numerological interpretation. HD, 340K

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GAMES

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☐ **Miramar Flight Simulator (1967)** - You are in control of all the speed and fire-power an F-18 has to offer! (will not work with Tandys) CGA

☐ **Pharaoh's Tomb (1974)** - Face monsters and traps as you explore the pyramid. Your goal is to survive.

☐ **Bass Tour (1925)** - Fish in your choice of lakes. Try to win the trophy.

☐ **ZZT (1921)** - Test your problem solving ability and your arcade skills as you battle your way through 43 rooms.

☐ **Field General (1931)** - Experience the excitement of a pro football game from a coach's point of view. CGA, HD

☐ **Insanity (1936)** - Find your way out of this maze before going insane! CGA

☐ **The Monuments of Mars! (1920)** - Many tough levels filled with puzzles, traps and creatures. 350K, CGA

VGA GAMES

☐ **Shooting Gallery (1990)** - Seven variations of a shooting range on your computer screen. VGA, mouse

☐ **VGA Sharks (1992)** - Recover lost treasure in shark infested waters in this action arcade game. VGA

☐ **Beyond Tetris/Joust (1997)** - Beyond is like Tetris with a twist. Joust is a VGA rendition of the classic. VGA

☐ **VGA Jigsaw (1993)** - Uses beautiful pictures to create puzzles for you to put back together. VGA

EGA GAMES

☐ **The Last Half of Darkness (1962)** - Scary graphics and mysterious puzzles to challenge your mind. EGA, HD

☐ **Dark Ages (1964)** - A brilliant arcade/adventure game with superb graphics and animation. 400K, EGA, 286 or faster machine.

☐ **Poker Slot (1989)** - Plays just like the video poker machines you see in casinos. Great graphics! EGA, mouse

☐ **Commander Keen (1986)** - One of the best games we have ever seen. Exceptional play and graphics. EGA

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TURBO PASCAL 6.0

TOM CAMPBELL

Some upgrade decisions are hard to make. I've been a staunch supporter of *Microsoft Word* for years now, but the change from 5.0 to 5.5 was too little too late. I had better things to do with $75. And *Microsoft C* version 6.0 was such an obvious hiccup that some users actually made noises in public about getting their money back (on CompuServe's MSSYS forum).

But if you're a *Turbo Pascal* user and you've considered switching to 6.0, worry no longer. It's a shoo-in. And if you're new to systems programming on the PC and are considering versions of Pascal for your next project, look no further. *Turbo Pascal* version 6.0 is, simply put, a masterpiece. There's a whole new integrated development environment (IDE, in Borlandese); mouse support; totally revised help; additional debugger features; a massive, tightly integrated library of user interface routines called *Turbo Vision;* and numerous smaller enhancements. In fact, some of the demo code for *Turbo Vision* is good enough for commercial applications.

The Mouse That Soared

While the most important new features of version 6.0 are *Turbo Vision* and better data hiding, the most obvious change is its new user interface. If you're a *Turbo C++* owner, you'll be used to the changes. Otherwise, you're in for a big surprise.

First of all, it mouses. A Microsoft-compatible mouse will work exactly as you expect a mouse to work. A click of the left button selects menu items or buttons, a drag selects text, and dialog boxes now contain multiple fields that you can jump to quite easily with the mouse.

I love it, since I'm a mouse user. I have no idea how many people will disagree with me, but I feel the new user interface is much less efficient than previous ones for users not equipped with a mouse.

While earlier versions of the Borland IDE employed submenus instead of dialog boxes and allowed every item on the submenu to be selected by pressing the first letter of the menu item, the new IDE leans toward multifield dialogs that force the mouseless user to jump among the fields by pressing the Tab and arrow keys. This means that some commands that once required only a single keystroke now require several. Since I like to use the mouse, this didn't pose a big problem with me, but I still appreciate a good, fast keyboard interface as much as the next person. *Turbo's* previous IDE was great that way.

MICHAEL HILL

IDEs of March

The second big change in the new IDE is multiple windows with large file capacity. They have scroll bars, zoom buttons, and close buttons, so using the mouse with the new edit windows is a breeze. And when you press F3 to open a file, the current file is no longer unloaded. The editor simply creates a new window, overlapping it on the previous one.

You can open as many windows as you like, but the first nine are instantly available via Alt and the window's number, from 1 through 9 (just like Microsoft's *QuickPascal*). Alt-0 brings up a list of active windows, including edit windows, help windows, register windows, and so on. While some people never get the hang of using several windows at once, I find it a lifesaver and demand it of any text editor or word processor I use.

Normally, I have about four windows open: the current source file, a text file explaining the source file, an ideas list, and another file or two related to the source (for example, other units). And you can now edit files up to a megabyte in size. Of course, you program using modern structuring and never use files that large, knowing that a well-designed software project is spread over many small, easily understood modules! Nonetheless, this large file size is handy for reviewing other people's code or large documentation files.

If you pay close attention to the windowing system, you'll begin to notice that all windows, not just edit windows, are used to their fullest potential. For example, you can use the Copy Example command from the Edit menu while perusing a help screen to place it in a temporary storage area called the Clipboard, then paste that code right into an edit window.

You can also select just part of any help window using the same selection techniques you use in an edit window. If you pop up a debug or help window, it becomes accessible through the Alt-*number* trick, and so on.

You now customize the integrated environment through TEML (Turbo Editor Macro Language), not the venerable TINST.EXE

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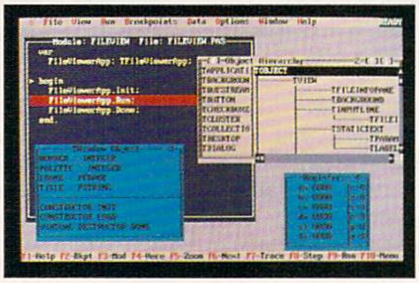
(TINST is now gone). TEML is a macro language with an external compiler. Unlike many high-level programmer's editors such as *Brief* or *EMACS,* there's no internal language interpreter. Instead, you add extensions via a separately compiled macro language. While this means that you have to learn a new (but simple) language and compiler to customize your environment, TEML gives you access to everything the integrated environment can do—far more than simply assigning actions to keystrokes. You can trigger any menu item, read from the Clipboard, quit the compiler, mark text, and dozens of other commands.

The vast number of new functions means that performance of the IDE is slightly less spectacular than it used to be, since there's a fair amount of disk swapping going on. However, the swapping is so well tuned that I never found it to be a problem on my 12-MHz AT; in fact, it's barely noticeable. My 386 is slightly faster, but the swap algorithms are so good the difference isn't pronounced. To put it another way, performance has dropped from great to very good.

This Is Demo Code?

Borland has taken the concept of demo code to new heights by providing some outrageously good examples—easily good enough to be from its own library. My favorites are probably the EDITORS unit and the HELPFILE unit.

EDITORS has everything you need to add text editors to your own applications, the main limitations being that file sizes are limited to 64K, maximum file size must be determined when the editor is initialized, and there's no word-wrap.



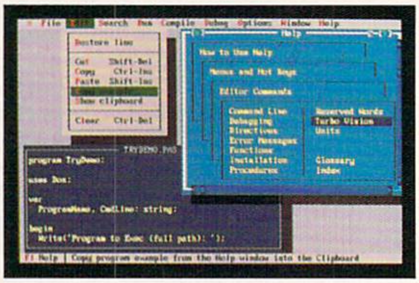
With the debugger, you can sail quickly through the object class hierarchy.

On the plus side, EDITORS can save and load files, has full cursor motion, does search and replace operations, and dynamically resizes the edit window. It mouses, too. The command processor is separate from the user interface, so you can give your editor the modest look of a *WordStar*-type screen or a flashier *Windows* look. Or both at once.

One demo program called *TV-EDIT* sports multiple resizable windows, a pull-down menu interface, and shelling to DOS. If you've ever tried to write an editor—to say nothing of a mouse-driven editor with a separate command processor and multiple windows—you'll recognize that this can save months of work.

Help!

Now that you have a free text editor for your own projects, what can you do to document all those snazzy new features for the user? Well, you can use the help system written in *Turbo Vision*—that's what. The HELPFILE unit is a badly documented but priceless 800 lines of code that gives you everything you need to add hypertext help to your applications.



Turbo Pascal's new IDE supports mice, pull-down menus, and multiple windows.

Just write the help material in any text editor, add a few dot commands, and presto—help just like the pros. You can show related topics in another color and jump to highlighted topics by clicking with the mouse or pressing Enter (or choosing some other command and implementing it yourself, since the source to the help system comes with *Turbo Pascal*).

Here's the Beef

All this is very nice, says the hard-core programmer in you, but what about enhancements to the language? Where's the beef? In *Turbo Vision,* for one place. *Turbo Vision,* to put it simply, is an object-oriented user interface library with mouse support, easy creation of windows and dialog boxes, menus, scroll bars, check and radio buttons, and an event-driven programming paradigm.

The good news is that *Turbo Vision* is a brilliantly conceived and designed, completely debugged toolkit that comes with a 400-page manual and could easily be a separate commercial product. The bad news is that if you haven't learned objects yet, you must learn them to use *Turbo Vision.* And the implications of an event-driven environment—that the user has full control over all actions, that any action should be revocable, that the user interface of your program

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should look very similar to the user interfaces of other programs using *Turbo Vision*—mean that you may well have to change your way of thinking and programming.

Chances are good that you won't be able simply to plug your old applications into this new framework. If you've programmed Mac or *Windows, Turbo Vision* will be a cakewalk. Otherwise, plan on spending at least a few weeks becoming familiar with a lot of new concepts.

Another gigantic addition is the inline assembler. A complete symbolic assembler with simplified segment directives lets you write assembly code without ever leaving the *Turbo Pascal* environment. The inline assembler itself is reasonably well documented, but look elsewhere for tutorials or even a reference for PC assembly language. Still, it competes quite effectively with *Microsoft's QuickC with QuickAssembler.*

The awkward {$F} directive for forcing near or far calls can now be overridden with the more conventional near and far directives, new keywords that act just like their counterparts in C. This lets you alter the standard subroutine calling convention *Turbo* provides so that you can speed up your code or use *Turbo* to call code written in other languages (such as the inline assembler).

I have always appreciated Borland's documentation for its unique respect for the user. Some amazing nuggets can be found in the supplementary documentation on disk, and it's the kind of information that you'll realize you need only when you're deep into a project and need nuts-and-bolts advice from someone who's been there.

For example, one of the DOC files for *Turbo Vision* explains such eminently useful issues as which parts of it can be overlaid (everything except for one small unit that manipulates interrupts), how much EMS can speed things up, how to set up the overlay pool, and how *Turbo Vision* objects are inherited (so you can best override them when writing new objects). Borland's documentation abounds with details like that, and, while they may seem extraneous, they can mean the difference between making or breaking a deadline.

Is It Worth the Upgrade Price?

The bottom line is always this: Does the new product offer you enough new features to merit its upgrade price? In the case of the new *Turbo Pascal,* the answer is an unequivocal *Yes.* Reviewers almost always get their software free, so you should always factor that into your evaluation of their work. But I paid for my upgrade and didn't even think twice about it.

I would cheerfully have paid just for the new development environment and *Turbo Vision.* But it also came with better object orientation through encapsulation, better code generation, the inline assembler, a gigantic new help system for the compiler itself, help code for your own applications, a new heap manager, the OBJECTS unit, and even more goodies that I haven't mentioned yet.

If you're shopping around for a Pascal, shop no more. *QuickPascal* is a dynamite product and less expensive, but it doesn't hold a candle to *Turbo* 6.0. *Microsoft Pascal* is a fine ISO standard Pascal and your only choice if portability to mainframes and use of older, pre-*Turbo* code is paramount. But if you want to develop state-of-the-art software using state-of-the-art Pascal development tools, look no further. ◘

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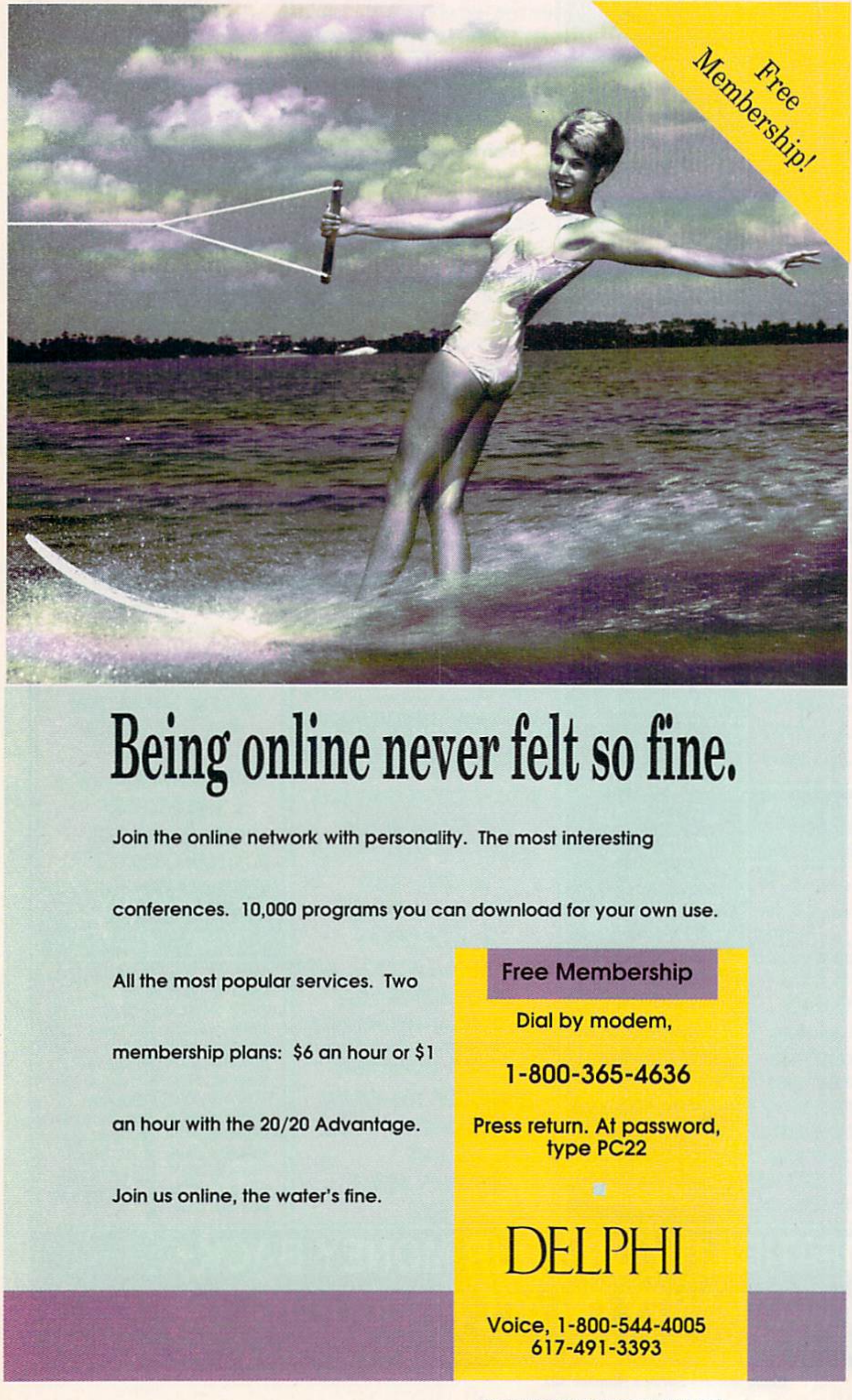
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DENNY ATKIN

You think you've finally mastered the operation of that intimidating metal, plastic, and silicon beast on your desk. In fact, you're confident enough using your personal software that you decide it's time to reach out and touch some other computers. After perusing the manuals, you log on to an online service for the first time. The chat line looks interesting, so you select it from the service's main menu.

Messages flow down your screen, but what are these people talking about? You try to follow the conversation, but it's filled with strange terms and indecipherable acronyms. Despite all your research and studying before you logged on, you don't seem to be able to speak the language.

The best way to approach anything with a computer is to read the manual. Most problems can be solved by a quick check of the documentation. However, you can't get a manual for your local BBS system. And the documentation provided by most online services is superficial at best. Even if the manual is thorough, it's not going to teach you online lingo.

Don't despair, though. Almost everyone online learned by trial and error. Just because you're a newbie doesn't mean everyone will be ROTFL if you flub a post. But to help you get started, here are some of the more common examples of online jargon and acronyms (STEVEX and the rest of the gang on People/Link helped fill in the gaps in my personal jargon dictionary).

Newbie: Someone new to a particular online service, BBS, or modeming in general. Newbies are often afraid to post anything publicly or ask for help, even though everyone else is usually happy to assist them.
Lurker: Someone who "lurks" on a BBS or online service without posting messages or uploading files. Actually, most users are lurkers—the vast majority of messages are posted by a few vociferous folks.
Emoticons: These are ASCII graphic faces used to express emotions in online messages. There are probably hundreds of variations, but some of the most common include
:-) Smiley face, used to indicate laughter.
:-(Frowny face, used to indicate disappointment or anger.
;-) Winky face, used to indicate a joke.
:-/ Wry face, used when something's funny in a bad way.
B´} Cool shades face, an example of one of many possible variations.
Post: Another word for an online message, as in *Did you read Kim's post?*
Nets: Networks, used to describe the commercial online services as well as Usenet and BBS networks like WWIV and FidoNet.
Lamer: Someone who only downloads files, never contributing new files to the BBS or service.

Those are just a few of the terms you'll encounter while reading the message bases. Things get really weird, though, when you enter one of the live online chat lines. Chat users have developed an elaborate shorthand system to keep typing to a minimum. Here are just some of the common abbreviations.

BCNU: Be seeing you. Used when you're about to leave a conference. It's considered rude to enter or exit a conference without saying hello or goodbye.
BRB: Be right back. If you're going to be walking away from your computer or temporarily leaving the conference, it's nice to let people know. (Also, AFK: Away from keyboard.)
BTW: By the way.
CU L8TR: See you later.
<g>: Grin. Synonymous with :-).
GA: Go ahead. Used after typing a long series of lines to let people know that they can now talk without interrupting you.
LOL: Laughing out loud.
Nytol: Good night, all—not the insomnia remedy.
ReHi: A greeting used when someone leaves a conference and then comes back.
ROTFL: Rolling on the floor laughing. Used after something *very* funny is said. (Also, the shorter ROTF and OTF.)
RTFM: Read the freaking manual. Used when somebody asks a question that could have been easily answered by checking in the manual.
Spam: Information that might not be legitimate or real, as in *This rumor may have a high Spam content.*
TINAR: This is not a review. Used before a user-written review on BIX, where the users aren't allowed to post product reviews. Of course, almost everything prefaced by TINAR actually *is* a review.
TNX: Thanks.
TNX 1.0E6: Thanks a million.
TTYL: Talk (or Type) to you later.

There are lots of other terms and acronyms, some specific to particular online services, but this dictionary should be enough to get you started. BTW, you can contact me on GEnie and BIX as DENNYA, on CompuServe as 75500, 3602, and on People/Link as DENNY. BCNU on the nets. ▫

DANIEL JANAL

GHOST IN MY MACHINE

Everyone loves a good mystery—except when it concerns your computer. And when that computer is essential to your home business, a mystery is almost certainly murder most foul.

One night after work, just recently, I installed a new software program that I was sure would help me create better-looking documents. It didn't take long to discover that the software I had just bought didn't work properly without a companion program—which I hadn't bought. So I went back to my trusty, old program.

That's when the problems started. The software didn't load.

I panicked. I couldn't work without my old software, which reads all the files I've created over the past five years.

I called my favorite computer guru, who patiently walked me through the vagaries of CONFIG.SYS, HIMEM.SYS, and other DOS combobulations. He suggested that my new program had corrupted the other files. That made sense. I took the new program off my hard disk and reconfigured the system. The problem persisted.

I called the folks who had sold me the computer. They couldn't have been nicer, even though the warranty had expired months earlier. I returned the computer, and they spent four hours (for free!) looking at the system, testing parts, and making backups. That's when we found a problem—the command file for my word processor was corrupted. We reasoned that the sector of the disk upon which the file was stored had been damaged by the hard drive head hitting the exact same spot 40 times a day, every day, for the past 10 months.

I was so relieved that I promptly ordered two megabytes of memory so it would run my new software program more efficiently. The technician even upgraded my ROM BIOS for free.

But I had forgotten Janal's Theory: If something can go wrong, then two things will go wrong, so you can't do an independent, scientific test to pinpoint the first problem.

I reloaded my word processor. It worked, but then my checkbook program froze. I figured that the new memory was bad. Or maybe that the new BIOS was to blame.

I lugged the computer back to the store. They couldn't figure out why my computer had locked up. They copied my checkbook program to the D drive. It worked fine. They reset the memory and exchanged the new BIOS for the old. We didn't have an answer, but my computer worked. I lugged it back home.

I loaded the word processor again and typed a few lines. The cursor stopped dead. I repeated my actions ten times with the same results. I'm not a computer expert, but I figured something had to be wrong.

I returned to the repair center for the third time. I set up, typed away, and waited for the lockup. Of course, it didn't lock up at all. Very embarrassing. It was here we entered the computing Twilight Zone. The technicians wondered if the problem might lie in electromagnetic fields in my office. "Was there any new construction near your office?" they asked. Maybe. "Well, put aluminum foil around the bottom of the computer," they said.

Then I noticed two clues. The computer was lying flat. I turn mine on the side. Could that be it? We used their keyboard. I drove home and got my keyboard. We plugged it in, and I typed away. The computer froze. And it froze immediately after I invoked a TSR. Things were getting interesting. Was it my keyboard, or was it my TSR?

I headed home, feeling like I'd finally solved the mystery. Once in my office, I set the unit on its side, wrapped it in aluminum foil so it resembled my Thanksgiving turkey, plugged in a keyboard from an old computer, removed the TSR, typed a bit, and then left the room for an hour. When I returned, I found the computer running fine. No problem, I thought.

The next day, I turned the computer on and heard two odd beeps. *XCMOS Checksum Error,* the computer told me. Another mystery. One friend suggested I replace the batteries. Another thought there was a hairline fracture of the motherboard. I wondered if that would be covered by major medical. My computer seems to work fine—even with the error. Maybe it just needs a little tender loving care.

Still, I expect it to die any minute. But before that happens, I'd like to propose a few strategies to help you deal with computer problems that arise in your home office:

- Make copies of your files regularly and store them somewhere safe, outside your house.
- Buy your computer from a reputable dealer who offers good service.
- Before buying a computer from a mail-order company, make sure the firm has a good reputation and a good service attitude. Be informed.
- If you buy through the mail, you'll want to find a local computer doctor with a good reputation. Compare carry-in and on-site service rates.
- Never introduce two new elements to your computer at the same time. If one part is bad, you'll have trouble pinpointing the culprit.

As for me, I think that my computer is haunted. ◘

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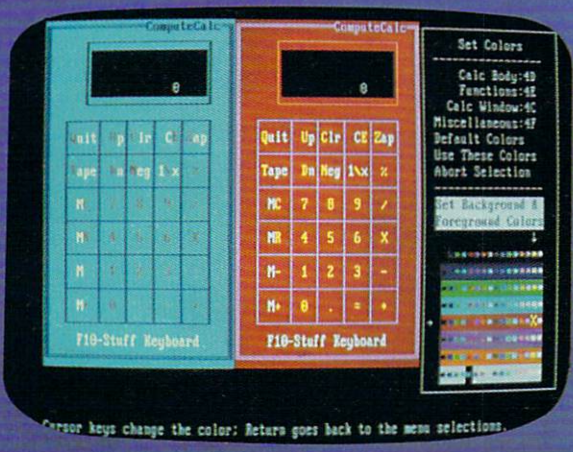
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F10-Stuff Keyboard
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Calc Body:4D
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Calc Window:4C
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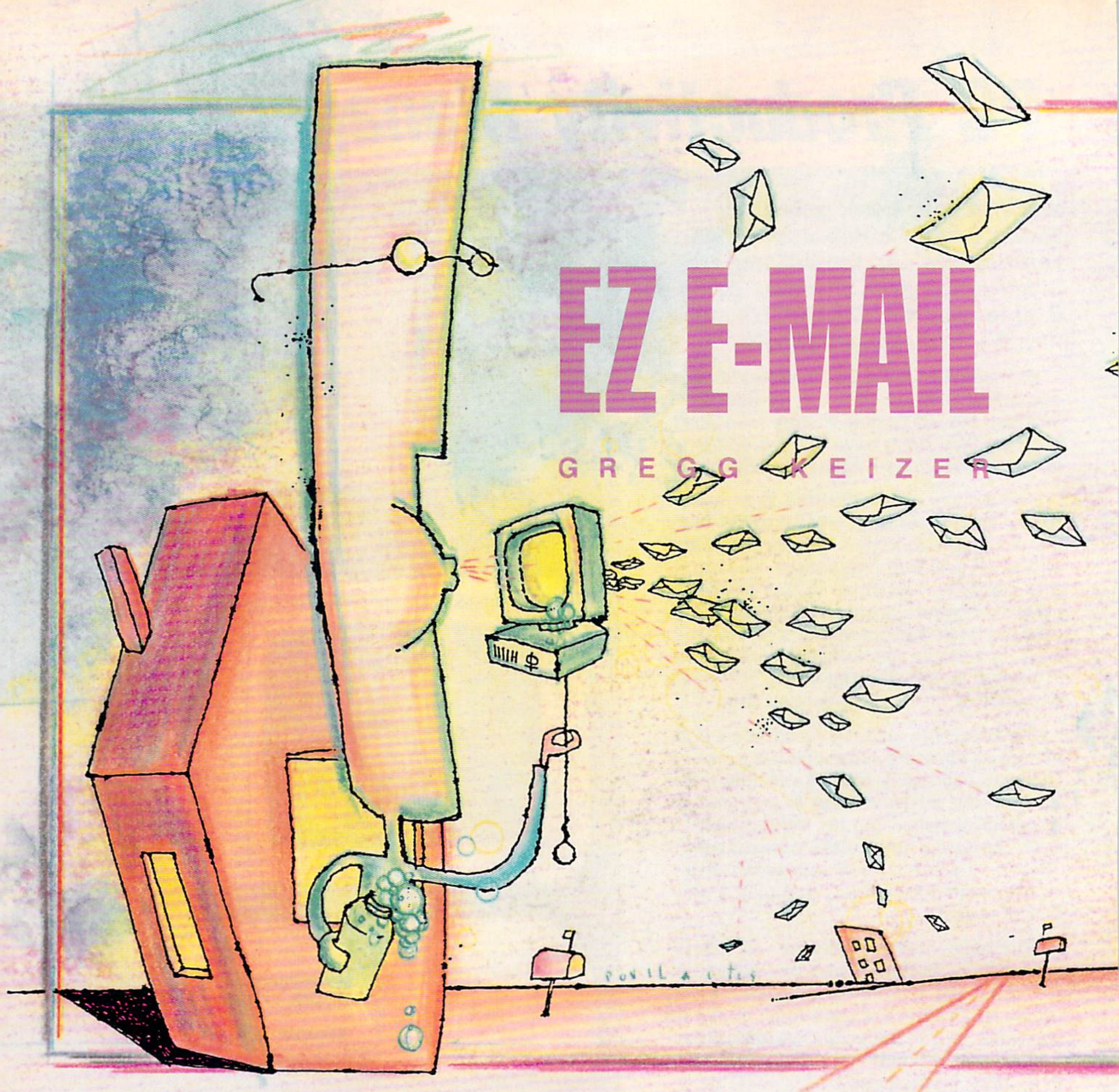


EZ E-MAIL

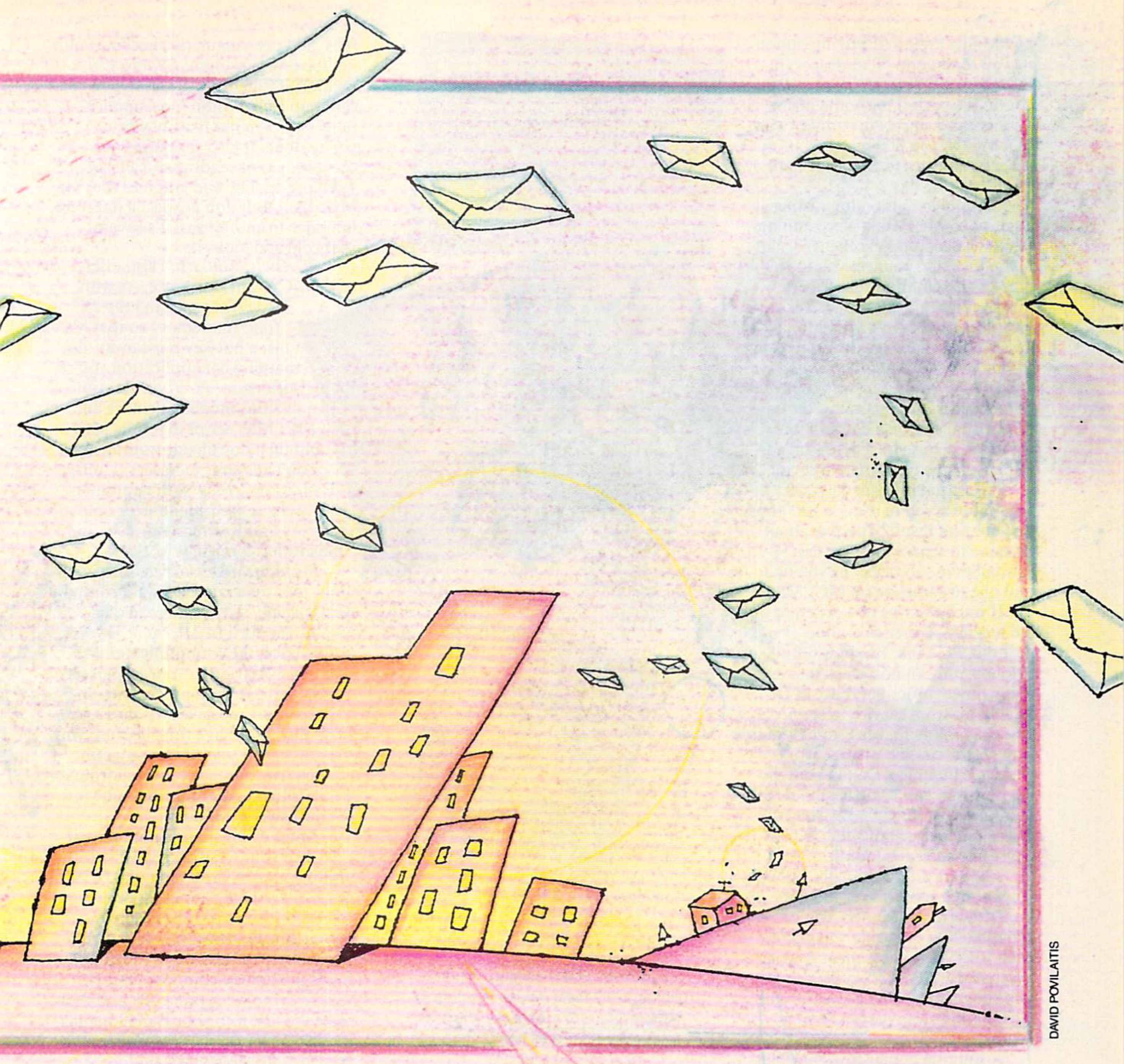
GREGG KEIZER

Postal rates skyrocket. Letters take days to traverse three states, nearly a week to wend their way from California or New York to your home office in the heartland. Messages get lost in the hog pile of junk mail.

Your home office demands reliable and rapid communications. Since you're trying to do it all yourself—perhaps running your business from home, moonlighting, or maybe doing day work at night—a break in your link to the outside world can be disastrous.

Electronic mail, or E-mail, can keep you connected 24 hours a day, seven days a week. You can maintain business relationships, develop new leads, and improve your at-home productivity with round-the-clock communications. Faxes can, of course, do much of this, too, but a fax machine costs at least $500. For less than half of that, you can equip your computer with a modem and E-mail software to integrate your communications with the rest of your PC work.

E-mail is actually a very specialized form of telecommunications. Like other forms of telecommunications, it uses computers, telephone lines, and modems to transmit information. Often designed to mimic paper mail, E-mail uses such familiar terms as *mailbox* and *address,* and



DAVID POVILAITIS

often charges for each message delivered, just like the post office. E-mail goes beyond simple messaging, though, to offer fax, telex, paper, and overnight delivery options. Increasingly, it doesn't matter whether the recipient has a computer.

In a crowded, busy home office, you want to make electronic mail as easy as possible: as simple as dropping a letter in the mailbox. Several software packages and integration techniques can turn your PC into a personal letter carrier.

E-Mail for the Masses

Of the 15 to 23 million E-mail users worldwide, most zip messages across private internal networks at major corporations. For those of us at home, though, it's the public E-mail networks that count.

MCI Mail is perhaps the best known of these services. Although it uses a stiff and outdated interface, MCI Mail holds the most promise for home office users. That's because of its popularity among business users. If your customers and clients use an E-mail network, they probably use MCI Mail—or a network you can reach through MCI Mail. Not only can you send text messages, but you can also transmit faxes and telexes, post paper mail, and even drop off mail to a CompuServe subscriber's mailbox. ▹

MCI Mail's Preferred Pricing option lets you send up to 40 messages (including faxes) for a flat fee of $10 per month. It's perfect for home office workers. And since you connect with MCI Mail via an 800 number, it doesn't cost extra to check for mail throughout the day.

CompuServe is an interesting alternative to MCI Mail. The giant online service features excellent E-mail capabilities that connect you to its three-quarter million subscribers. More important, you can also exchange messages with MCI Mail addresses and send faxes. If you're using *CompuServe Information Manager* to navigate the online service (highly recommended), you can easily compose mail offline and then connect when you're ready to send. There's no additional charge for E-mail, but you pay the normal rates, or 21 cents per minute if you're using a 1200-bps modem. End result? You pay about the same to send a message to a CompuServe subscriber as you do to send one to someone on MCI Mail.

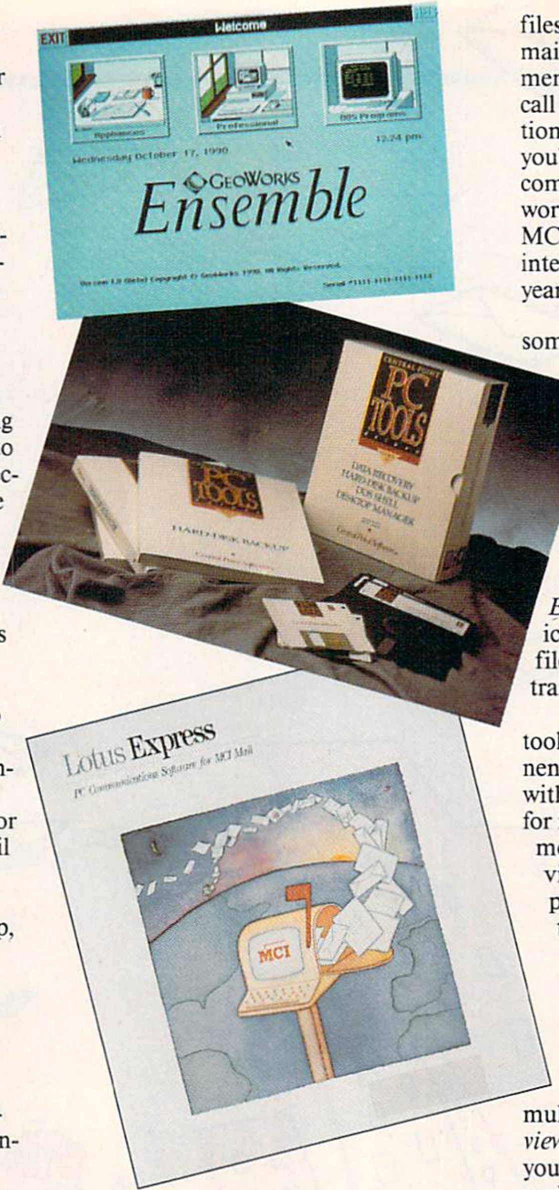
If you subscribe to a different online service—America Online, People/Link, PC Link, Prodigy, GEnie, or Delphi—you can post electronic mail to any other subscriber. Ease of E-mail varies from service to service; America Online makes E-mail a snap, primarily because of its *GeoWorks Ensemble* interface. Delphi and GEnie, however, can bring beginners to their knees. Prodigy makes you pay for each message above the 30 free you're allowed each month.

All share a flaw, though. The recipient must subscribe to the same online service as the sender. You can't guarantee that everyone you want to reach will be available through your designated E-mail service. It's as if each state had its own postal service and couldn't swap parcels with its neighbors.

A solution comes from DASnet, an interpreter for more than 60 E-mail services. You keep your current E-mail network but send messages to DASnet instead, which first translates and then retransmits the mail so that it's understood and accepted by the recipient's service. DASnet isn't cheap—you pay $4.75 a month and around $0.75 per message. But it has the advantage of extending your E-mail reach to include virtually anyone with an electronic mailbox.

Manage Your Mail

In the frantic, every-minute-counts home office, E-mail had better be almost as easy as licking a stamp. Your PC promised to free you from drudgery and let you concentrate on turning a profit or staying productive at home.



GeoWorks offers a high-potential package. *PC Tools Deluxe* features an integrated word processor. *Express* cures your E-mail headaches.

The ideal scene would be something like this: You're writing with your word processor, and you decide to send a message to a client in California. You type out the message, pull down a menu, and pick *Send Mail.* Choose the customer's name from a list that appears and hit Enter. That's it.

Unfortunately, things aren't that simple—yet. The best you can hope for is some help with and shielding from the intricacies of E-mail. Something to protect you from interfaces only a techie could love.

If you're using MCI Mail, *Lotus Express* can automate many of your E-mail tasks, including calling MCI, retrieving and sending messages and files, and even regularly checking your

files, and even regularly checking your

mailbox for new mail. *Express* is a memory-resident program, so you can call it up from within most applications and then put it away when you're done. It also simplifies the complex job of sending spreadsheet, word processing, and graphics files via MCI Mail. But don't expect a dazzling interface from *Express;* it's several years old and looks it.

PC Tools Deluxe 6.0 also offers some MCI Mail assistance. As with *Express,* you can keep *PC Tools* in memory so that it's just a hot-key press away, no matter what application you're working in. *PC Tools'* communications module includes an MCI Mail script that calls MCI and then downloads waiting mail or uploads your messages. Unlike *Express, PC Tools* won't automatically check your mailbox or upload files. As a simple mail retriever and transmitter, though, it works well.

PC integrated packages offer mail tools, too. Integrated software components usually share and swap data with little effort. In *Microsoft Works,* for instance, the communications module links you to your E-mail service, and the word processor composes mail and saves the messages to disk. You save time because you don't have to quit one program and run another to switch from writing to mailing; instead, you just switch windows.

Another way to integrate E-mail into your PC workday is with a multitasking environment like *DESQview.* Potent on a 386, *DESQview* lets you keep several programs active simultaneously. *DESQview* also gives you limited cut-and-paste capability, so it's possible to compose mail in your favorite word processor and then paste the text into your E-mail manager. *DESQview* can be temperamental, though, and you may spend lots of time tinkering with it in an attempt to get everything working smoothly. Unless you're an experienced PC user or familiar with *DESQview,* consider another direction.

That direction, and potentially the path to E-mail of the future, lies in graphical operating environments like *Windows* and *GeoWorks Ensemble.* Both point-and-click products put a lot of stock in integrating your work and in connecting applications to their documents. Although *GEOS* applications are scarce and typically underpowered, you can use *GeoWrite,* a *GEOS* word processor, to write messages and then create a workable E-mail manager with *GeoComm,* a communications program. Multiple windows, cut-and-paste capabilities,

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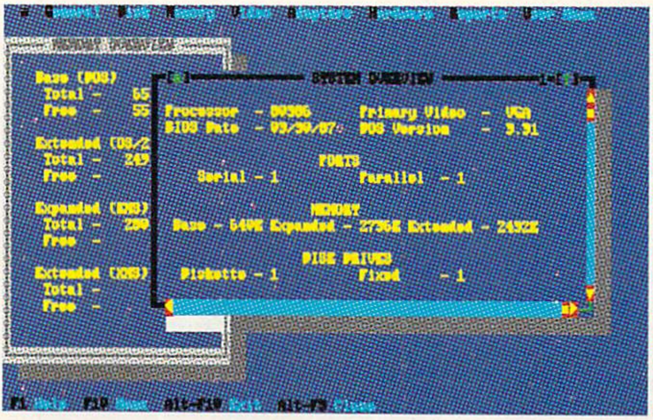
"PC Magazine Editor's pick... the 33 best utilities... System Sleuth"
PC Magazine, June 26, 1990



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Base (DOS)     ┌─────────────── SYSTEM OVERVIEW ───────────────┐
 Total -   65  │
 Free  -   55  │Processor  - 80386      Primary Video  -  VGA
               │BIOS Date  - 03/30/87   DOS Version    -  3.31
Extended (OS/2 │
 Total -  249  │                PORTS
 Free  -       │   Serial - 1           Parallel  - 1
               │
Expanded (EMS) │                MEMORY
 Total -  280  │ Base - 640K Expanded - 2736K Extended - 2432K
 Free  -       │
               │              DISK DRIVES
Extended (XMS) │ Diskette - 1          Fixed     - 1
 Total -       │
 Free  -       └────────────────────────────────────────────────┘
```

INSTALLATION ASSISTANT can help locate just the right place in your system to install new boards. With Installation Assistant, dreaded I/O ports, DMA channels and IRQs are no problem. System Sleuth Pro has extensive hardware testing facilities for AT/386 and 486 class systems. Test disk drives, video adapters, system board components, RAM and more.

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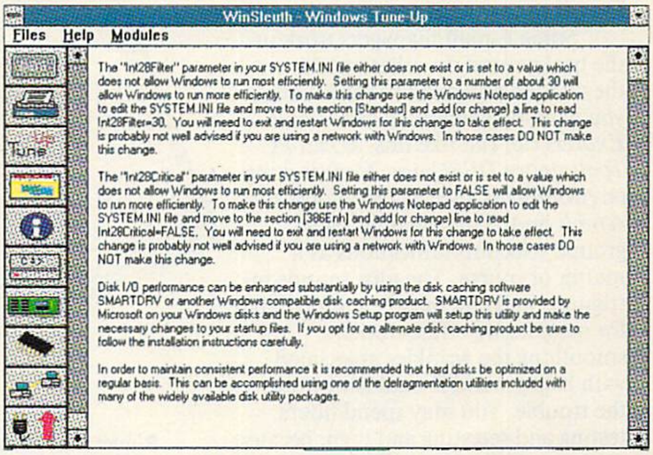
"WinSleuth should be dubbed 'Solutionware'"
Paul Bonner, PC Computing, January, 1991



The "Int28Filter" parameter in your SYSTEM.INI file either does not exist or is set to a value which does not allow Windows to run most efficiently. Setting this parameter to a number of about 30 will allow Windows to run more efficiently. To make this change use the Windows Notepad application to edit the SYSTEM.INI file and move to the section [Standard] and add (or change) a line to read Int28Filter=30. You will need to exit and restart Windows for this change to take effect. This change is probably not well advised if you are using a network with Windows. In those cases DO NOT make this change.

The "Int28Critical" parameter in your SYSTEM.INI file either does not exist or is set to a value which does not allow Windows to run most efficiently. Setting this parameter to FALSE will allow Windows to run more efficiently. To make this change use the Windows Notepad application to edit the SYSTEM.INI file and move to the section [386Enh] and add (or change) line to read Int28Critical=FALSE. You will need to exit and restart Windows for this change to take effect. This change is probably not well advised if you are using a network with Windows. In those cases DO NOT make this change.

Disk I/O performance can be enhanced substantially by using the disk caching software SMARTDRV or another Windows compatible disk caching product. SMARTDRV is provided by Microsoft on your Windows disks and the Windows Setup program will setup this utility and make the necessary changes to your startup files. If you opt for an alternate disk caching product be sure to follow the installation instructions carefully.

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Circle Reader Service Number 196

and multitasking in both *GeoWorks Ensemble* and *Windows* let you quickly compose mail, copy it to a clipboard, jump to a communications window, and paste in the message once you're connected to the service.

Make E-Mail Easy

Stick with what you know. That's the best way to ease into E-mail. Rather than depend on the limited text editor that accompanies your E-mail manager, compose mail with your word processor. You know its commands, it probably includes a spelling checker, and it can certainly save work as ASCII files, the preferred format for E-mail.

Some E-mail managers work in the background. In other words, they'll send and retrieve mail while you work on something else. *Lotus Express* can run like this, as can *PC Tools* under *DESQview.* Multitasking environments such as *GeoWorks Ensemble* and *Windows* offer background telecommunications as a matter of course. The idea sounds intriguing, and you may be tempted, but for most home office workers, smoothing the wrinkles associated with background E-mail isn't worth the trouble. You may spend hours testing and retesting and then, because you're a small-volume E-mailer, only save a moment or two each day. Be sure the payoff is worth the effort before you get in too deep.

E-Mail Managers

DESQview—$129.95
DESQview 386—$219.95
Quarterdeck Office Systems
150 Pico Blvd.
Santa Monica, CA 90405
(213) 392-9701

GeoWorks Ensemble—$199.99
GeoWorks
2150 Shattuck Ave.
Berkeley, CA 94704
(415) 644-0883

Lotus Express—$150.00
Lotus Development
55 Cambridge Pkwy.
Cambridge, MA 02142
(800) 343-5414

Microsoft Works—$149.00
Microsoft Windows—$149.00
Microsoft
One Microsoft Way
Redmond, WA 98052-6399
(800) 426-9400

PC Tools Deluxe—$149.00
Central Point Software
15220 NW Greenbrier Pkwy., Ste. 200
Beaverton, OR 97006
(800) 445-4073

Microsoft Works
NEW VERSION
DESQ view
Quarterdeck
Version 2

E-mail's a window away with *Works*. *DESQview* is a multitasking shell.

One of E-mail's greatest assets is its portability. You can take your mailbox with you wherever you go, if you use E-mail. If you travel with a laptop computer, equip it with a pocket modem (Practical Peripherals makes a great miniature 2400-bps modem) so you can read and send mail on the road.

Another E-mail bonus, especially when you're using an online service as your mail provider, is easy file transfer. Services such as America Online, which uses the *GeoWorks Ensemble* interface, are especially adept at simplifying the process. In America Online you can attach a file to an E-mail message. It doesn't matter what kind of file it is—*WordPerfect* document, *Quattro Pro* work sheet, or *PC Paintbrush* graphic—America Online ships it to its destination with a few clicks of the mouse. You can cut costs and delivery time by sending files rather than expressing disks.

Finally, look in your mailbox. Do it religiously. *Lotus Express* checks your mailbox for you at regular intervals, but you've got to take the initiative with other E-mail managers. I look at MCI Mail first thing at 9:00 a.m. and last thing at 7:00 p.m. I also check CompuServe once a day and America Online three times a week.

Neither Snow, nor Rain. . . .

Adding E-mail capabilities to your home office won't bankrupt you. You can pick up a 2400-bps modem and E-mail management software for just a bit more than $200. The cost may be small, but the benefits are huge—constant communications that are more likely to be read and answered than traditional letters.

If you're unsure about an E-mail strategy, start with MCI Mail and a simple E-mail manager. I recommend *PC Tools;* it's a painless way to get and give mail. The *DESQview* alternative is tantalizing but ultimately unwieldy because cut-and-paste operations between applications are so awkward. Nothing beats the slick way you click from word processor to communications/E-mail manager in an environment like *GeoWorks Ensemble* or *Windows.* I like *GEOS* and hope E-mail management becomes part of that operating environment's software soon. And I'm following the development of PC contact software like *Act!,* which is rumored to include E-mail connections in its next version.

Today, E-mail is a viable alternative to the phone or the fax. More important, though, is the power and convenience of E-mail. Something that provides instant access to your clients, customers, and coworkers is addictive—so addictive, you may never want to lick another stamp. ⊡

Selected E-Mail Networks

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Quantum Computer Services
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Vienna, VA 22182
(800) 227-6364

AT & T EasyLink Services
5000 Hadley Rd.
S. Plainsfield, NJ 07080
(800) 367-7225

CompuServe
5000 Arlington Centre Blvd.
Columbus, OH 43220
(800) 848-8199

DASnet Service
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(408) 559-7434

MCI Mail
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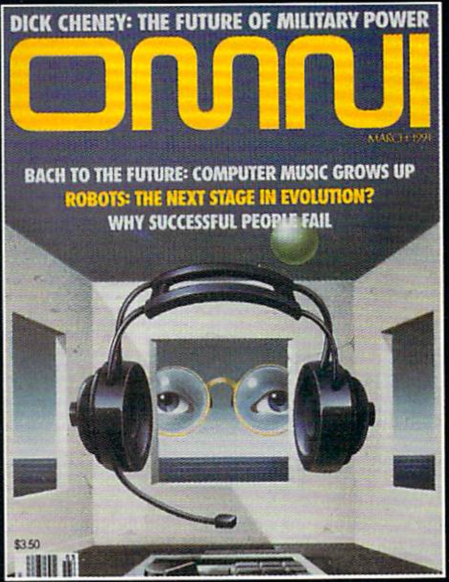
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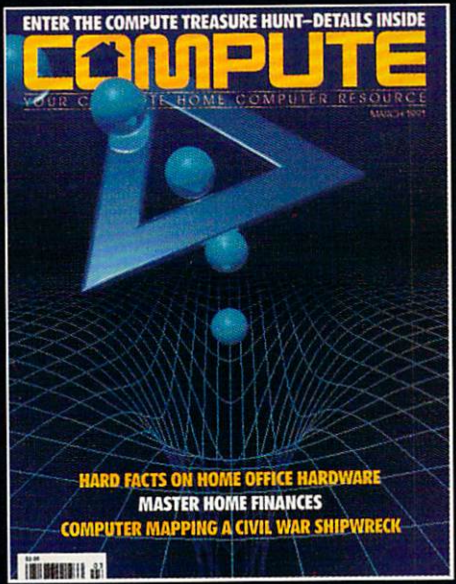
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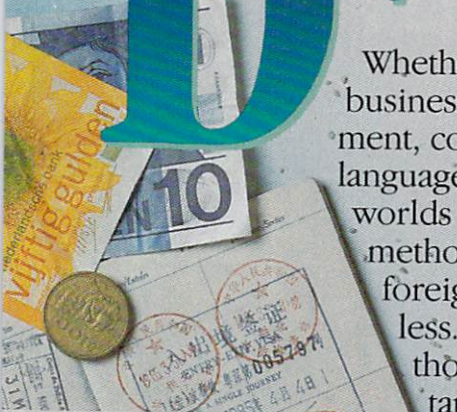

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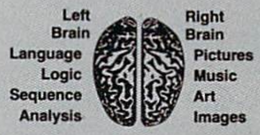
"American managers with language skills open more doors."
Wall Street Journal Editorial
July 25, 1988



"(the superlearning method is) fascinating . . . the results are extraordinary."
Prof. Lawrence Hall
Harvard University

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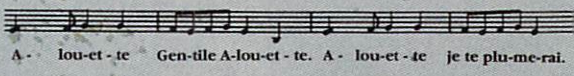
Have you ever wondered why you can remember the words to a song with little or no conscious effort? Music stimulates right brain activity. Speech is a left brain activity. When the two are combined, as in a song, you have left/right brain linkage. You've used your whole brain, so your memory is much stronger. Accelerated learning uses the same technique. You will learn the language as *stresslessly* as a child does, by hearing new vocabulary and phrases in alternately loud whispered, and emphatic intonations, all accompanied by slow, rhythmic music. The effectiveness of Baroque music as a memory aid is well documented and leaves you feeling alert and rested.


A - lou-et - te Gen-tile A-lou-et - te. A - lou-et - te je te plu-me-rai.

"American ignorance of other tongues has been hurting American business executives in their competition for (overseas) markets."
The New York Times
September 5, 1988

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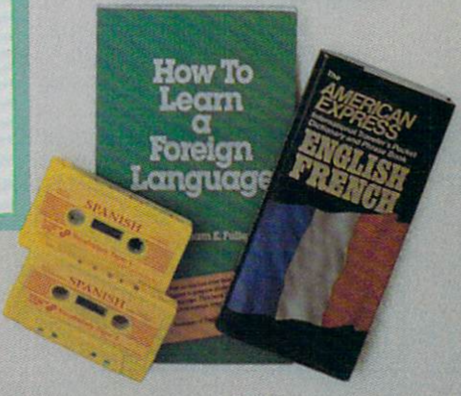
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DISCOVERY PATHWAYS

WALLS COME DOWN

STEVEN ANZOVIN

When Dustin Webb was six years old, he wrote a story about becoming an astronaut. "I want to be an astronaut for a job. I will go in a spaceship to space. When I grow up I will walk in space. I will be as fast as I want. Ernie [an imaginary pet monkey] will go with me. He will steer the spaceship. He will feed me and sleep with me. Teach Ernie to talk so I can be understood."

Dustin needed Ernie's help because Dustin has cerebral palsy—he can't walk, talk, or feed himself.

Today Dustin is ten years old and goes to school in a mainstream class in West Chester, Pennsylvania. Dustin's family has never gotten him a monkey, but they've found a better helper—a computer. His family began experimenting with an Apple when he was still a preschooler. Now he communicates with the aid of a Toshiba 1100 Plus laptop, an Artic Symphonix voice synthesizer, and Morse code translation software. Using three switches, one at each hand and one on his head, he can tap out Morse code fast enough to hold a conversation with a patient listener. Dustin is also expert at using a letter board to converse, but his real ambitions are learning to use a keyboard, getting a faster laptop with a hard disk and a better screen, and stepping up to a synthesizer with a more natural-sounding voice.

Kids are fascinated by Dustin's cool electric wheelchair and by his computer. Teachers and other adults are won over by his computer savvy. He has won several awards for writing. In fact, says his mother, Ann, Dustin's abilities are limited only by how well he can use his electronic tools.

Only a few computer companies develop products for the almost 38 million disabled people in the United States (see "Building Bridges" in the February 1990 issue of *COMPUTE!*). *Adapted access* or *augmentative communication* are the aims of those who tailor computer systems to the needs of disabled people. IBM and Apple have ongoing adapted-access development projects. Apple, for example, provides a "sticky key" program in its Macintosh system software that allows multiple simultaneous keystrokes for one-finger typists.

But it's small companies that produce most of the real-world products. Joe Sullivan of Duxbury Systems in Littleton, Massachusetts (508-486-9766), is well known for well-crafted Braille translation software. Another small developer is MicroSystems Software of Framingham, Massachusetts (508-626-8511), which developed the Morse code translation software and some other programs that Dustin uses. Founded by Dick Gorgens, former head of Alloy Computer Products, MicroSystems focuses on networking utilities, developers' tools, and neural networks. But it also offers a line of PC-compatible software, called HandiWARE, that addresses the needs of people with different types of disabilities.

HandiKEY translates input from alternative devices—a mouse, joystick, sip-and-puff tube, headstick, foot switch, or any external switch—into standard PC keyboard input. Scan and select a predefined or user-defined cell on the screen, and *HandiKEY* types out the word or text string that the cell represents. *HandiCODE* allows Morse code input from external devices and supports most of the standard speech synthesizers on the market with voice output. *HandiCHAT* works in a pop-up window and synthesizes voice directly from typed or alternative input.

HandiWORD is a statistically weighted predictive dictionary that works with other *HandiWARE* programs and most word processors. When you type a letter, *HandiWORD* guesses the word you want to type and lets you finish it with just a keystroke or two. As you use it, the program analyzes your word usage and makes progressively more accurate guesses. This significantly speeds typing for Morse, one-fingered, or headstick typists. *MAGIC* (MAGnification In Color) interactively enlarges part or all of the screen for visually impaired users. The company also sells *SeeBeep*, a utility for the hearing-impaired that flashes the screen when the computer beeps.

Most of these programs draw on techniques developed years or even decades ago in university labs. Other companies have sold similar products, but their cost has been prohibitive to many potential users. The HandiWARE products are not only thoughtfully designed—easy to learn, easy to use, and well integrated with one another and with other popular applications—they are also inexpensive. Prices range from $20 for *SeeBeep* to about $200 for *HandiWORD*.

A portable system for adapted access that includes a laptop computer, voice synthesizer, alternative input device, and complete suite of HandiWARE software now costs around $5,000 to $7,000. Prices continue to fall, but even at that cost, it's a negligible expense measured against the freedom that adapted access gives to people like Dustin Webb. With a computer, Dustin and thousands like him are no longer cut off from the world. Instead, they are able to unleash their imaginations upon it.

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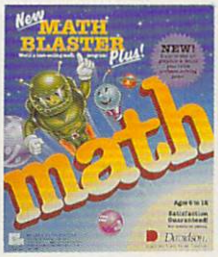

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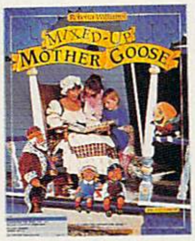

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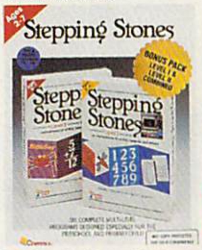

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SOFTWARE SELECTION GUIDE

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   ☐ IBM/Tandy & Compatibles with 3 1/2" disk drive
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ROOTS

Try a little archaeology. Summer is the perfect time to root around your family tree. You've got time on your hands and a PC in front of you, and summer is the time for family reunions. You've always wanted to pull together the threads that tie you to your relatives, by blood and by marriage. If you're like millions of Americans, you can't help wondering where your family has been, what it has done, and where you fit in.

These are natural questions. We're all fascinated by tales of courage, accomplishment, and tragedy. Most families have their share of these kinds of stories. All it takes is a little detective work to uncover them.

Your home computer may not be able to help you with the footwork, but it can make sense of the intertwining of your lineage. Three PC software packages take different tacks to help you in your genealogical quest. Depending on your level of interest, patience, and budget, you'll find one of these three suitable for sifting through the dust of ages. ▹

GREGG KEIZER

Fun for the Family Tree Maker

For a quick genealogy payoff, you won't find anything better than *Family Tree Maker* from Banner Blue. This PC program uses a card file interface to cushion you from the rigors of the database. Entering information is fast and painless, primarily because of the program's limited ambitions. It's when you've got your family safely saved to disk that *Family Tree* really takes root. The name hints at its forte—printing family trees. You won't find any that are more attractive, especially when you use a laser printer. *Family Tree* is the best choice for the dabbler in genealogy or the beginner eager to see some results. It's also the easiest to use of the three programs reviewed here.

Boomers are reaching that age when one begins to think a bit more about family and mortality. . .

You can start with anyone in your family, a plus when your notes are disorganized. Each family unit—husband, wife, and children—fills one of the onscreen family cards. Here you record such basic information as the date and place of birth, marriage, and death for the parents and the name, sex, and birth date of each child, if any. List a child, and *Family Tree* automatically creates a new family card with that person as husband or wife.

Family Tree publishes professional-looking ancestor and descendant trees and a funky photo family tree with blanks you fill by pasting in pictures. It's easy to create just the right tree, since you decide how many generations to include and who serves as the trunk. A selection of borders and box styles lets you customize charts even more.

Family Tree is not for the serious genealogist; its database just isn't rugged enough. But for most of us, the program's simplicity and excellent tree making fit our recreational interest in family history just fine.

Awkward at the Family Reunion

If you are serious about researching your family, have the patience of Job, and don't have a lot to spend, *Family Reunion* may fit the bill. This is a real database, with enough fields (the blanks you fill in) to overwhelm even the most meticulous researcher. You can record over 100 different pieces of information about each person listed in your *Family Reunion* files. But the program is unnecessarily hard to set up and even harder to use. The database has the flavor of the early 1980s, when computer users were hackers and had the time and expertise to get the software to do precisely what they wanted it to do. In fact, the documentation includes a glossary of database terminology. Current programs should do more for us; they shouldn't require much specialized knowledge. The program would be easier to use if its documentation concentrated more on the actual operation of the program and less on secondary matters such as terminology.

Still, *Family Reunion* has its winning graces. Its price is right, and it can store over 1500 ancestor records on one 5¼-inch disk. You can define many of the database fields to suit your own needs, and some of the charts and work sheets are impressive. *Family Reunion's* six-generation ancestor chart isn't fancy—no boxes or borders here—but it's clear and easy to follow. You'll also like the family work sheets, which contain all the basic information about one family, complete with enough room for up to 20 children. You can even print blank work sheets for recordkeeping to take with you on your research trips.

Professional Roots

The *Lotus 1-2-3* of genealogy, *Roots III* is impressive even before you install it on your hard disk. The sheer heft of its manual indicates that it's serious productivity software. It's not empty weight either, for the program is documented from start to finish. *Roots III* isn't software you'll pick up in an afternoon and be pushing to its limits by nightfall. But it packs the power that top genealogists (and wannabes) require. Everything's here—a nearly up-to-date interface, a powerful database that specializes in lightning-fast searches, a tremendous printing and reporting capability, and enough extras to please a professional.

You can enter detailed footnotes, customize several vital fields individually for each entry (not database-wide, an important difference), and quickly update individual records. All kinds of data find a home in *Roots.* Know the date and place an ancestor was put on a ship's passenger list? *Roots* has a spot for it. Stumble across a mention of your great-grandfather's bar mitzvah? You can record the date and location in *Roots.*

Once you've got people in the database, *Roots III* makes it easy to study their connections. You can display the immediate family of anyone with a key combination, then step through the generation quickly. Or you can trace the pedigree of an individual or ask *Roots III* to calculate the kinship of any two people in the database. *Roots III* prints 14 types of charts and reports, including the scholarly Register and Record Plan formats, three different pedigree charts, a family group chart, and a marriage record report. *Roots III* can also help you publish your genealogy data in book form.

The power doesn't come cheap. *Roots III* is by far the most expensive program highlighted here. And though you could certainly grow into its impressive list of features, be sure of your commitment to the hobby of genealogy before steering for *Roots.*

Ashes to Ashes, Dust to Dust

It's hard to see how genealogy once got along without computerization. And with baby boomers getting older, expect computer-assisted genealogy to grow even stronger.

Boomers are reaching that age when one begins to think a bit more of family and mortality—two interests that converge productively in genealogy, the study of the passing of individuals and the permanence of families. Conveniently, these are the same people who propelled the PC into everyday use at work and at home. It's a safe bet that genealogy software and online research will become easier and more popular in the years ahead.

Computers make the perfect tools for personal archaeology. Hand me that trowel, please, and my work boots. I've got some digging to do in the late eighteenth century.

Family Tools

Family Reunion
FAMware
1580 E. Dawn Dr.
Salt Lake City, UT 84121
(801) 943-6908
Requires IBM PC or compatible, 512K RAM; hard disk recommended—$59.95

Family Tree Maker
Banner Blue Software
P.O. Box 7865
Fremont, CA 94537
(415) 794-6850
Requires IBM PC or compatible, 512K RAM—$59.95

Roots III
COMMSOFT
2257 Old Middlefield Way
Mountain View, CA 94043
(800) 327-6687
(415) 967-1900
Requires IBM PC or compatible, 512K RAM; 640K RAM will allow approximately 3,000 names, 10,000 names for each additional megabyte of expanded memory (LIM 4.0), up to 65,000 names; hard disk recommended—$250.00

SEE THE WORLD

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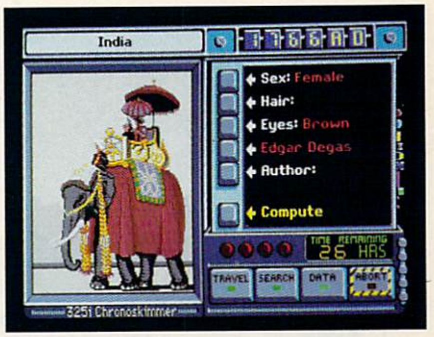
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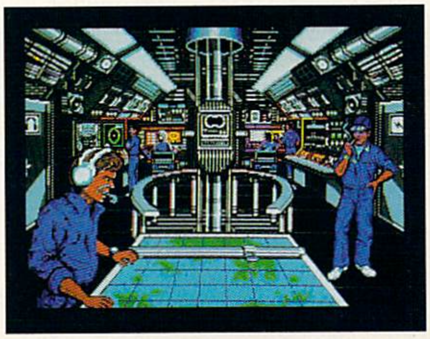

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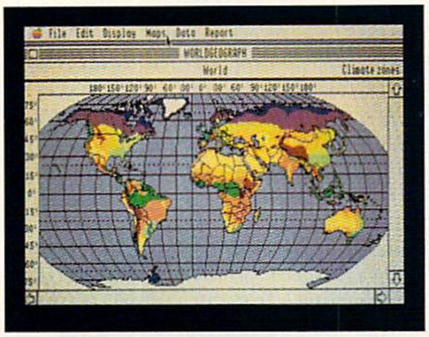
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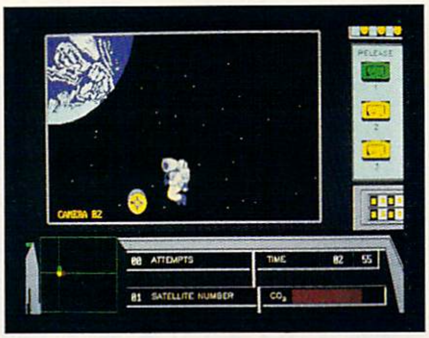
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GAMEPLAY

SPACE GAMES
FOR REAL

ORSON SCOTT CARD

When a gamewright sets out to simulate a real-life situation, one of the toughest challenges he or she faces is the fact that people can compare the finished game against the real thing. Players want a golf simulation to feel like golf (minus the walking); they expect a flight simulator to feel like flying (without having to suffer the drastic consequences of mistakes).

Science-fiction simulations should be much easier, right? After all, nobody's going to be able to hop into a starcruiser and check out what it's *really* like to explore new planets. The sci-fi gamewright can be lazy and get away with practically anything!

Oh, if only it were so! Unfortunately, almost the opposite is true. The science-fiction audience loves to second-guess the author every step of the way. No matter how great you think your idea is, some reader, or game player, is going to figure out why you're a complete idiot. And then that same reader, or game player, will tell you and everybody else *exactly* how dumb your inventions are.

Take it from someone well-versed in the trade—you sometimes feel that it's easier to simulate reality than to simulate fantasy.

But, picky and nasty as it sometimes is, the science-fiction audience keeps coming back for more sci-fi games, if only because the computer is the only way the strange and powerful experience of science fiction can be recreated with such immediacy. Boot up your starship, and, for a few minutes, you really seem to soar between the stars.

The roots of starflight games go back to, logically enough, *Starflight* from Electronic Arts (415-571-7171). Working miracles with CGA graphics, this game gave you the feel of striding through the galaxy, of meeting alien races and either fighting or befriending them. All the while, you searched for the secret of the most ancient aliens—the secret that you had to find in order to save the galaxy. Playing *Starflight* was like living a grand old space opera—without the fat lady.

Computer technology has come a long way since then. *Star Control* from Accolade (408-985-1700) and MicroProse's *Lightspeed* (301-771-1151) are two new entries in the genre that *Starflight* defined. These two latest entries share several features. Both of them replace the flat, top-down star map of *Starflight* with three-dimensional star maps that rotate in your view, so that you always get a sense that space is high and wide and deep. Both take you hopping from star to star without the possibility of getting lost that was part of the fun—and sometimes the tedium—of *Starflight.* And both games give you a chance to compete with alien species in a race to colonize other worlds.

Despite these similarities, though, the games could hardly be more different. *Star Control* may have *Starflight* as its daddy, but its mama is the old arcade game *Asteroids*. In fact, you can skip the whole colonizing routine and just play space combat, with a stunning array of ships to choose from, each with its own particular strengths and vulnerabilities. You can spend hours just discovering different ships, exploring and mastering all of their many features.

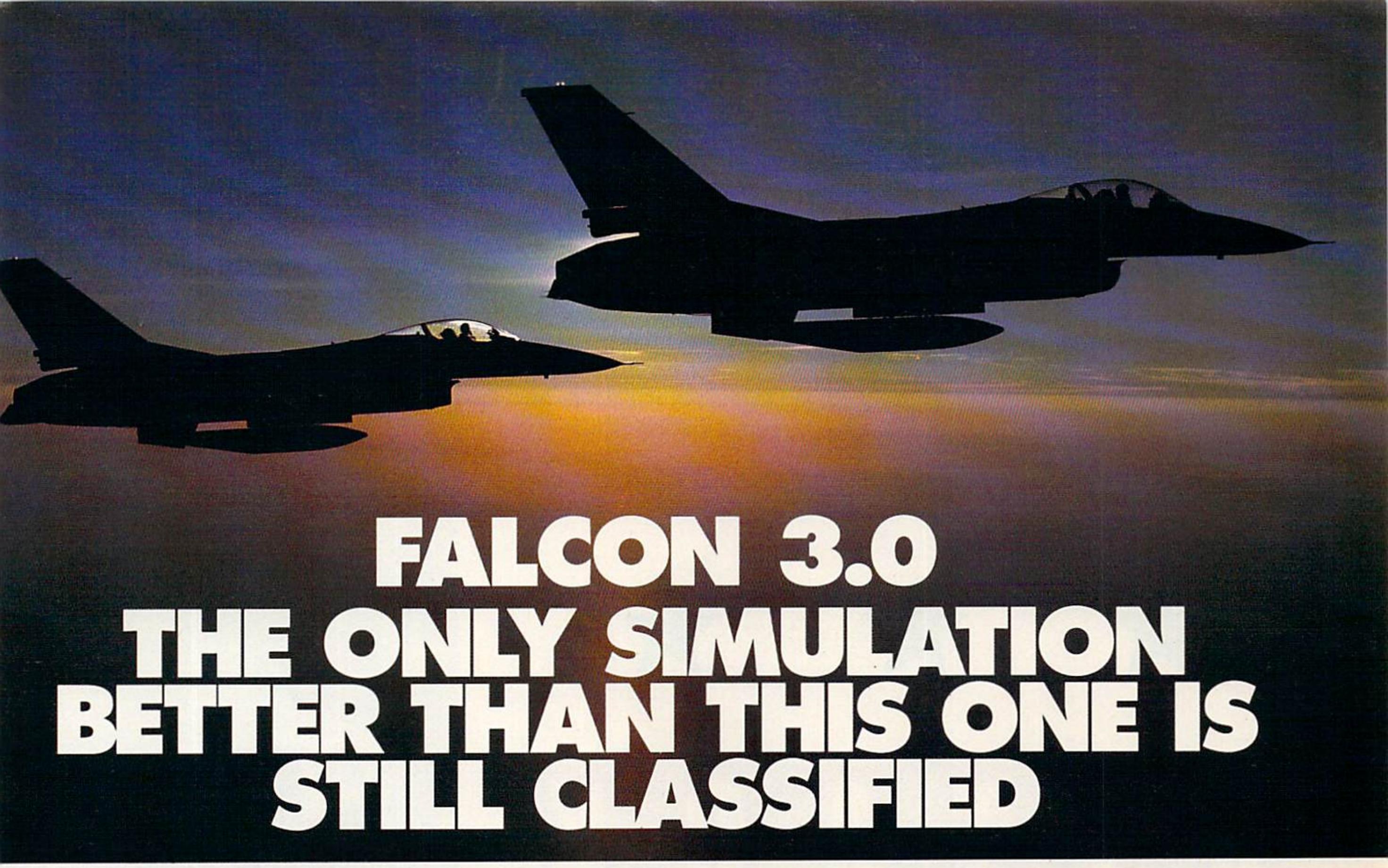
When you get into the full game, it begins to resemble a wonderful sort of three-dimensional chess. You move from star system to star system, searching for worlds to exploit or colonize, fortifying the ones necessary to your supply line. Time passes. Then, suddenly, you find yourself in the same star system with an enemy, and the combat begins. The game never lags, even during the star-map phase of the game. The early phases have a comfortable, unhurried feel.

Geoffrey, Emily, and I have decided that the game is a lot more fun when you play against humans—the computer is just too smart and fast for us. (We haven't figured whether that's because the computer opponent speeds up on my 486 machine or because we're just too klutzy to compete.) When we play against each other, *Star Control* is a great romp, especially when the viewer's perspective zooms in for close combat and zooms out for wider maneuvering. Dodging planets, swinging around to use our cool new weapons, we get the feel of realtime space combat in a way no other game has ever offered.

Lightspeed, on the other hand, while having a first-rate combat phase, concentrates on exploration and colonization. Like *Starflight,* it lets you meet aliens and try to make trade or make treaties. What do you trade for? Fuel and spare parts—space combat can really wreck an engine room.

In fact, the most wonderful innovation in this game is that engine room. You'll almost hear Scotty growling, "We're trying to get full power, Captain," as you scramble to steal parts from the blasters to keep the shields up.

Star Control for fast-action combat and chesslike maneuvering; *Lightspeed* for a fully developed universe and the unfolding of a story. Both games are superb examples of smooth, user-friendly design; both games take you into space with a level of reality that will satisfy all but the most fussy of sci-fi nerds. Yet despite their similarities, they are so different that they prove once again that a good game will always be fresh and new, no matter how many others have already gone down the same road.

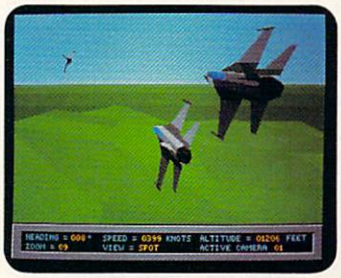


FALCON 3.0 THE ONLY SIMULATION BETTER THAN THIS ONE IS STILL CLASSIFIED

The bogey came out of nowhere. You see him just off your tail. The adrenalin hits you like a fist. You call your wingman: "Viper One, I've got a bandit on my six. This is not good..."

The original Falcon™ F-16 Fighter Simulation was acclaimed for its realism. Now, Falcon 3.0™ takes this authenticity to the edge. The flight models are real. The terrain is real. The radar and weapons systems are real. And the threats are real. No phony weapons or magic bullets here... just the best civilian F-16 simulation available. You don't just play Falcon 3.0, you strap yourself in and get ready for battle.

You go to afterburner and your Falcon jumps, slamming you back in the seat. The MiG 29 has just reached missile range... There! He's fired, the deadly rocket screams toward you, seeing nothing but the heat of your exhaust. Without thinking, you drop a series of flares hoping to confuse it, and yank back on the stick... 50 degrees... 80... over the top... your Head Up display shows you're pulling 9g's...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ZOOM = 09 VIEW = SPOT ACTIVE CAMERA 01

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... Nearly blacked out, you ease forward on the stick. The g's drop, and you can see again. There he is! You're on HIS six now. This is going to be sweet. As you get tone you know he's yours.

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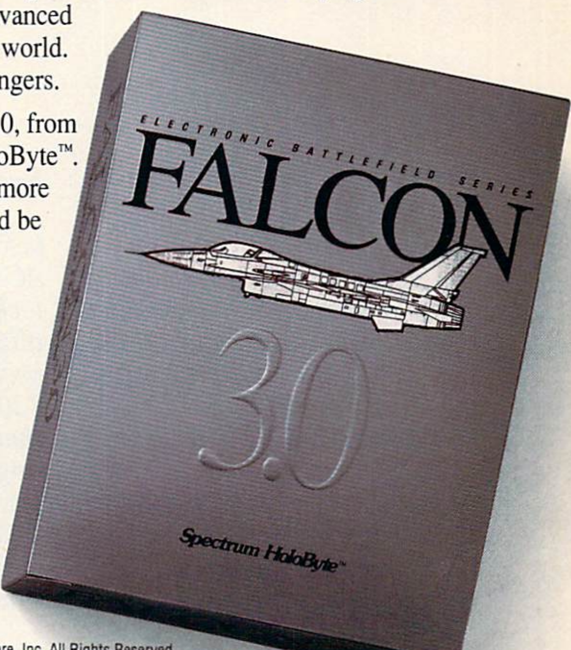

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Circle Reader Service Number 223

IRAQ ATTACK

A FIRST LOOK AT *FALCON* 3.0

You stay low after takeoff from King Khalid, eight F-16s kicking up dust from the hardtack desert heading north to Basrah. You thread the needle through the known SAM sites in Kuwait and come out the other side OK.

Your AWACS plane, circling safely to the south, locates two Iraqi MiG-23s along your flight path, and you can't resist the targets. You don't have enough fuel for too much "mucking about," as your friends in the Royal Air Force say, but you take the flight to the left a little to try and get a better angle on the attack.

You line up both bogeys before switching your radar to ACM mode and getting a target lock-on. They immediately realize they're in trouble and break hard away, but two AIM-120 AMRAAM missiles are on their way. It was a poor aspect angle for a shot, but you're rewarded with one explosion. You blow past the other bogey before he has time to recover and take a shot.

You barely have time to get back on course before entering the target area. You've been picked up by what's left of the Basrah air defense network, and ZSU 23-mm antiaircraft guns start to hose the air in all directions. A look over your shoulder shows your guys holding a nice, tight formation as you start your run on the target, the National Defense Headquarters building. Switching to ground-mode radar, you line up the building dead ahead and hit the trigger once for target lock. A few more seconds to close the range. . . . You hit the pickle button twice more and feel the release of two AGM-65E laser-guided Maverick missiles.

HR
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COURTESY OF SPECTRUM HOLOBYTE

Pushing the throttle to afterburner stage 2, you accelerate off the target and look back just in time to see your two missiles slam into the front door of the building. That'll be one for CNN! Now, let's see if you can find that other MiG. . . .

Release the Falcon

Rarely has a flight simulator update been awaited with so much anticipation. Three months before its scheduled release, the *Falcon* 3.0 message area on the GEnie online network already had well over two hundred messages. Since word first leaked out about its development, there has been an incredible amount of speculation (some good and some not so good) about what this simulation is all about. So, rather than start right in on what *Falcon* 3.0 *is,* let's talk a little about what it *isn't.*

First of all, *Falcon* 3.0 is definitely not just a VGA version of *Falcon AT.* This is new code—all of it. Both products simulate an F-16 Falcon jet fighter, but that's where the similarity ends.

Falcon 3.0 also doesn't cave in to those who complained that *Falcon AT* was too complex. If anything, this version is even more complex. But that doesn't mean that the folks at Spectrum HoloByte have ignored the ▹

★ ★ ★

RICHARD

SHEFFIELD

need—and the market—for entertaining jet combat games as well as serious simulations. Both are provided in *Falcon* 3.0. But more on that later.

What It *Is*

Now let's talk about what *Falcon* 3.0 *is.* It's the most complete and accurate jet fighter simulation to be found this side of a security clearance. Period.

There are three areas which must be addressed to make a jet combat simulation accurate: the flight model, the terrain, and the instruments (including target acquisition systems).

Let's look first at the flight model, or rather the *four* flight models. A flight model is the set of mathematical equations used to simulate the way the aircraft responds to input from the controls and to the various other forces at work during flight: lift, weight, drag, speed, and so forth. *Falcon* 3.0 gives you four models to choose from with increasing levels of realism (and therefore increasing levels of difficulty).

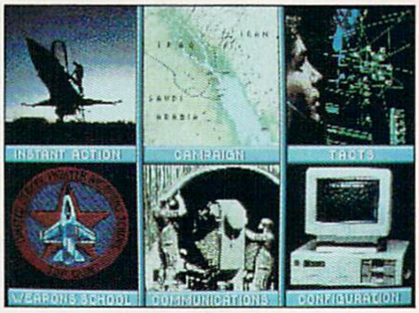
The first three can be run on an IBM-compatible powered by an 80286 or higher CPU without modification. The fourth model is called the High Fidelity flight model. It requires a math coprocessor chip to operate.

The High Fidelity model is the one Spectrum HoloByte uses in the ASAT (Advanced Situational Awareness Trainer) developed for the Air Force. This is as real as it gets on a desktop computer. But a math coprocessor chip isn't required to enjoy *Falcon* 3.0. In fact, the subtle differences between the High Fidelity model (which requires the math coprocessor) and the Complex model (which doesn't) will probably be lost on all but the most sophisticated gamers.

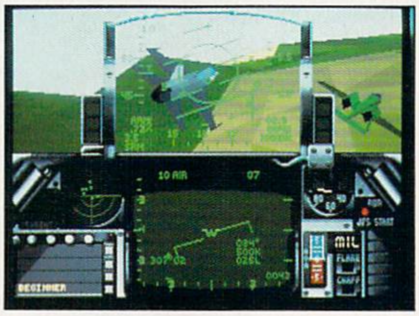
The Right Stuff

Achieving the "feel" of real flight requires more than just a good flight model. You also need a believable world to fly around in. *Falcon* 3.0 provides three combat areas: Kuwait/Iraq, Panama, and Israel. The terrain in these 300 × 300 mile areas is accurately modeled on topographical maps. Say good-bye to pyramid mountains on a tabletop. The 3-D terrain features rolling hills along with mountains, valleys, rivers, and roads. These features are rendered realistically and can be fully utilized to mask your aircraft from the enemy.

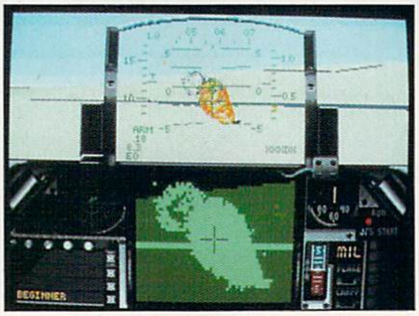
That brings me to the instruments and targeting. The F-16 is, after all, just a complex weapons delivery system. *Accurate, realistic,* and *complex* are three words that come immediately to mind to describe Spectrum Holobyte's simulation. With five different radar modes, each with its own Heads Up Display (HUD), it's no wonder that the designers felt little need for copy protection; the basic act of acquiring a target and firing a missile is almost impossible to accomplish without the keyboard layout (which shows some function for almost every key) and a detailed knowledge of the operator's manual.



***Falcon* 3.0's opening screen.**



Searching with an F-16 and an A-10.



A tank's fiery end in a desert battle.

Falcon 3.0 will test your skills with many more important radar parameters to keep in mind than ever before. At the same time you will be flooded with information. It will quickly become apparent why situational awareness is a prized skill among the jet pilot elite.

If all this sounds a little overwhelming (it did to me!), not to worry. The designers have gone to great lengths to make all this technology accessible to even the most inexperienced computer pilot. In the process, they have overcome the biggest complaint about the game's predecessor, *Falcon AT. Falcon* 3.0 is realistic and *fun* as well. Much more attention has been paid to the game part of the simulation than in previous versions.

Four Action Modes

There are four modes of gameplay. The Instant Action mode is the first and the easiest. Often referred to as *Rambo mode,* this simplified version of the game is meant to get the novice up and flying quickly and to compete with other simpler air combat sims such as MicroProse's *F-15 Strike Eagle II.* In this mode, everything is easier; operating the radar, targeting, and even flying the aircraft are all easy to accomplish with just a few keystrokes to remember. When you start this mode, you are immediately placed in a target-rich environment, and the action is nonstop. Shoot down as many enemy planes as you can before getting killed. See if your score earns you a place in the list of top aces. Fun and action are emphasized over accuracy in the Instant Action mode, but it's a great way to start to learn your way around a very complex piece of software.

The heart of the game is the Campaign mode. The campaigns in each of the three battle areas are logic driven rather than scripted. So rather than have a limited set of missions laid out in a win/lose decision tree (as in Origin's *Wing Commander*) *Falcon* 3.0 generates your next mission based on what you accomplished in the previous one. This way no two campaigns are ever alike. Say your mission is to destroy a bridge to keep an armored division from crossing the river into your territory. If you fail, the bridge will remain standing and the tanks will cross. You will have to attack them—on the move and on your soil. Had you been successful, the tanks would've been jammed up on the other side of the bridge and much easier pickings.

There will be eight aircraft flying on your side in each mission (including your assigned wingman), but they may not all be F-16s. In some cases you may be escorting F-15s, B-52s, or Apache helicopters. And you will have to do more than just fly. As squadron leader it will be up to you to choose which pilots fly which mis-

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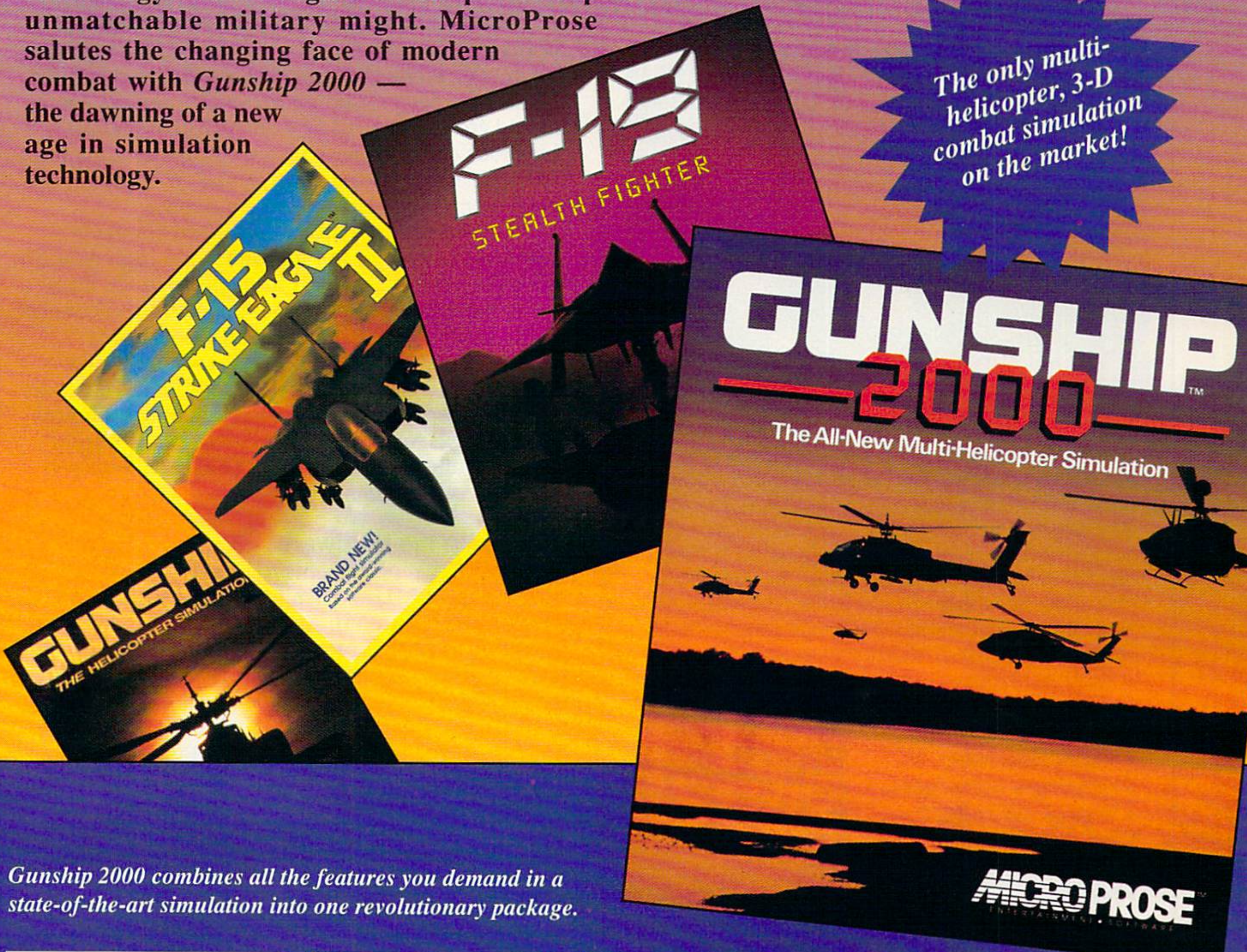
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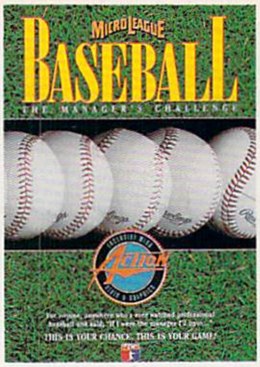

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sions. Each pilot will have different skill levels for dogfighting, bombing, and flying ability, as well as a fatigue rating. Each successful mission may improve your skill levels, but if you fly them too often, the fatigue factor will start to set in. This is a real factor to consider, since, like the real pilots in the Gulf War, your squadron will be expected to fly three sorties a day.

The Red Flag mode is billed as a training tool. Still under development when I visited Spectrum HoloByte, this mode is designed as a scenario generator that lets the player use a simple editor to place enemy air and ground forces. If it's developed as planned, this mode could be used in conjunction with the three battle areas to re-create many actual air battles of the last fifteen years—and to create new ones.

Communication mode allows two players to fight head to head or to fly together in a joint mission as part of a campaign. This first release in the Electronic Battlefield Series (EBS) supports direct connection, a modem, and possibly even a Local Area Network (LAN). Future additions to the EBS will allow you to fly cover for A-10 attack planes (Avenger A-10) or close-air support for a group of M1 Abrams tanks (Tank). And there continues to be discussion about a multiplayer version of the EBS to be played on one of the online networks.

Setting Up the Hardware

The hardware requirements to run all of this are heavy. The 12-MHz AT isn't the target market; it's the absolute minimum. And a good bit of extra memory set up as EMS is required to run many of the features. Digitized sound, the VCR-like flight recorder, the 3-D TACTS (Tactical Aircrew Combat Training System) cube, and modem play all require EMS to function. EMS can also run some of the game's graphics to speed up the screen frame rate. If it comes to a choice between EMS and a math coprocessor upgrade, EMS is the clear winner. Not only is extra memory cheaper, but it buys you a lot more game enjoyment.

Based on the preliminary version of the software I tested, there are still a few unknowns. First is the artificial intelligence programmed in for the enemy aircraft. It's difficult to reach a good compromise between too hard to kill and too easy. Also yet to be seen is how this game performs on slower AT computers. There will be ways to decrease the detail level to improve speed, but it remains to be seen whether speed really improves enough to make the game playable. And if it *is* fast enough, do you lose a lot of enjoyment along with the detail level? We'll have to wait for the final version to find out.

All in all, it's hard to think of anything that's been left out of *Falcon* 3.0. It has an engaging campaign mode, modem support, a slick interface with animated sequences, a selection of flight models, and more bells and whistles than you have keys to operate. And as for realism, for once software lives up to its publicist's claim in the press release: "If it were any more authentic, we'd be in trouble." ◘

IBM PC AT and compatibles, EGA or VGA; supports Ad Lib, Sound Blaster, Roland, and Tandy sound cards—$69.95

64/128 VIEW

TOM NETSEL

The results are in and tabulated for the 1990 Gazette Readership Survey. Thanks to all of you from around the world who took time to participate. We published some preliminary figures last month; now we'll look at the final figures.

It's interesting to note that 77 percent of you own a 64 and 42 percent own a 128. Looking back at results from previous surveys, these figures have changed little over the years. (Since many readers own more than one computer, the figures total more than 100 percent.)

It looks as though 20 percent of you are planning to buy another computer this year. Early figures had 28 percent of you moving toward IBM or its clones, but as surveys continued to arrive, that figure topped out at 38 percent. The big surprise is that 24 percent of computer shoppers say they'll buy a 128. Another 18 percent plan to buy a 64, 16 percent plan to buy an Amiga, and 4 percent say they'll buy a Macintosh.

The survey reports that 59 percent of you own modems and 25 percent of you use them to access a commercial online service. QuantumLink, which is Commodore-specific, is the service of choice for 50 percent of those reporting. CompuServe is next with 13 percent. Many readers reported calling local bulletin boards and smaller services. At least one reader taps into the St. Louis library computer five hours a month, and another spends at least half an hour a day logged on with the *Albuquerque Tribune* newspaper.

A joystick is the most frequently owned peripheral (93 percent), followed by a dot-matrix printer (84 percent), a modem (59 percent), a mouse (49 percent), an REU (36 percent), and a letter-quality printer (26 percent).

Subscribers to the magazine account for 89 percent of those responding. Of the 8 percent who get Gazette on newsstands, I hope those who live in this country have heard that now it's only available by subscription in the U. S. Friends pass their copies on to 2 percent, and the remaining fraction get the magazine some other way.

Those with family incomes of less than $20,000 account for 3 percent of the replies, and those with family incomes of more than $100,000 account for 2 percent. The biggest share (40 percent) falls in the $30,000 to $50,000 range. Advertisers like to know how wealthy readers are. I hope they'll take notice that 96 percent of you say that you'd be interested in buying 64/128 disk products at affordable prices and that Gazette ads affect 83 percent of you. A whopping 97 percent of you buy computer products by mail, with 3.6 products per year the average. One person (in the $100,000+ category, naturally) says he buys at least 40 titles a year.

The majority of *Gazette Disk* subscribers (63 percent) are satisfied with the product, but many of you said you'd like for us to lower the price. In case you haven't noticed, we've recently done just that. The subscription price is now $49.95, down $20.00 from last year. That's about $4.00 a month for 12 disks and magazines. *PC* and *Amiga Resource Disk* subscriptions cost the same, but subscribers get six disks for that price.

Many of you (40 percent) want more *GEOS* coverage, 24 percent don't, 24 percent are undecided, and 12 percent didn't answer.

Finally, what about our new format? Since October we've received a lot of mail about our new look. Some of you have praised it; others have expressed disappointment. At least one reader threatened legal action unless we returned to the old format. We were curious what readers in general would say when asked their opinion. According to the survey, 40 percent of you like it, 29 percent don't, and 31 percent are undecided.

Next month we'll discuss what all these figures tell us and how they'll affect Gazette in the future. Once again, thanks for sharing your comments and suggestions with us. ⊡

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NEWS&NOTES

Welcome to Metropolis

Metropolis is an online service for adult interactive-game enthusiasts, now available on Minitel (2900 Westchester Avenue, Suite 101, Purchase, New York 10577). Presented as an imaginary city rather than a database of services, Metropolis offers a wide range of interactive entertainment, including 21 multiplayer games, shopping, messaging, and chatting. The city contains Citizens' Directories, a Visitor's Centre, a Communications Centre, a Recreation Centre, and a Library.

For more effective interaction, Metropolis offers more than 75 action commands that include the use of body language and the expression of feelings and emotions. Subscribers can blush, dance, pinch, pout, whistle, whimper, scream, shrug, and create their own action commands.

Metropolis costs 16 cents per minute in the U.S. and Canada, but it can be reached by users in more than 20 countries. It's just one of the many online services offered by Minitel's worldwide network. Call (914) 694-6266 for free "Getting Started" software for the 64 or IBM.

Fly a Dragon

If you liked playing *Dragons of Krynn,* you'll love flying them into combat in *DragonStrike* ($39.95) from SSI (675 Alamanor Avenue, Suite 201, Sunnyvale, California 04086).

Learn to fly dragons as you attempt more than 20 different missions in the DragonLance game world. Progress through three different orders of Solamnic knighthood, gaining bigger and more powerful fire-breathing mounts as you go. Collect all the magical items you can find; you'll need them in the fierce heat of dragon combat.

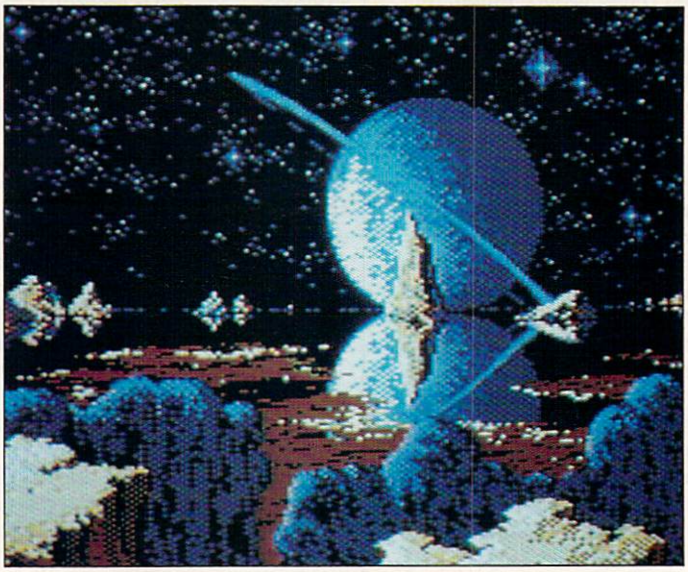
Seek and Destroy

Put on your camouflage fatigues and test your mapping skills with *Metal Gear* ($14.95), a new release from Ultra Software (900 Deerfield Parkway, Buffalo Grove, Illinois 60089), a subsidiary of Konami.

Wind through five levels as you search for 20 special weapons and equipment to seek and destroy the title character and end the terror spree of the evil CaTaffy. Discover the weapons and equipment in enemy trucks and storehouses, or get them from certain soldiers of fortune.

As you try to capture weapons in your quest to rescue hostages, little do you realize that CaTaffy has unleashed against you the most powerful weapon of them all: Metal Gear. Luckily, you do have a few high-tech allies.

Your most vital tool is your transceiver, which lets you communicate with Commander South, who is at Fox Hound's Headquarters and feeds you crucial information on Metal Gear's location. The mission ends when you destroy Metal Gear—or he destroys you.



Far Out

***Far Out* by Jack Modjallal of Encino, California, is this disk's Picture of the Month.**

Welcome to "Gazette Gallery." Each month *Gazette Disk* features a collection of the best 64/128 artwork submitted by our readers. We pay $50 for each piece of art we accept and an extra $50 for the one selected as Picture of the Month. Send original art to Gazette Gallery, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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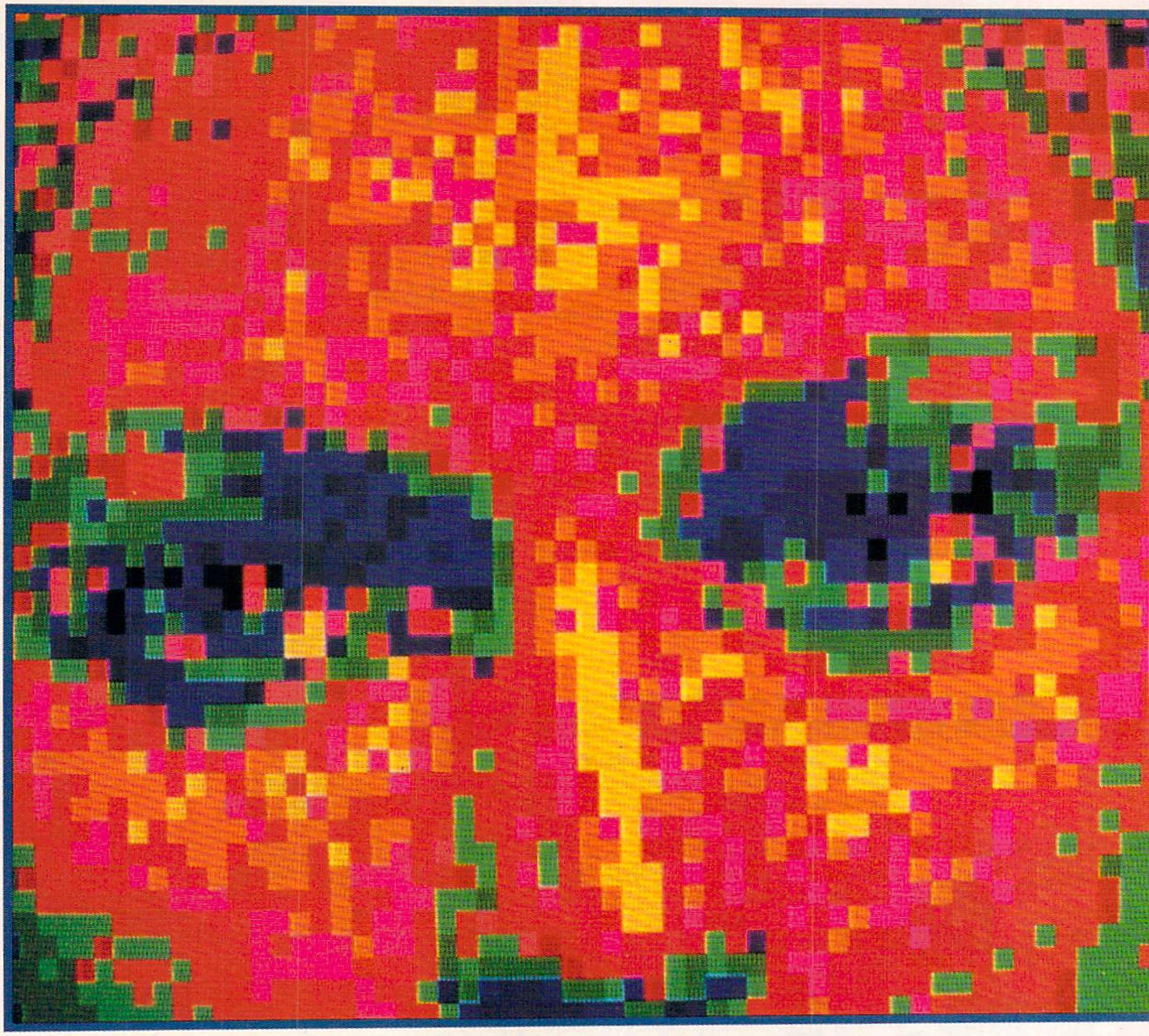
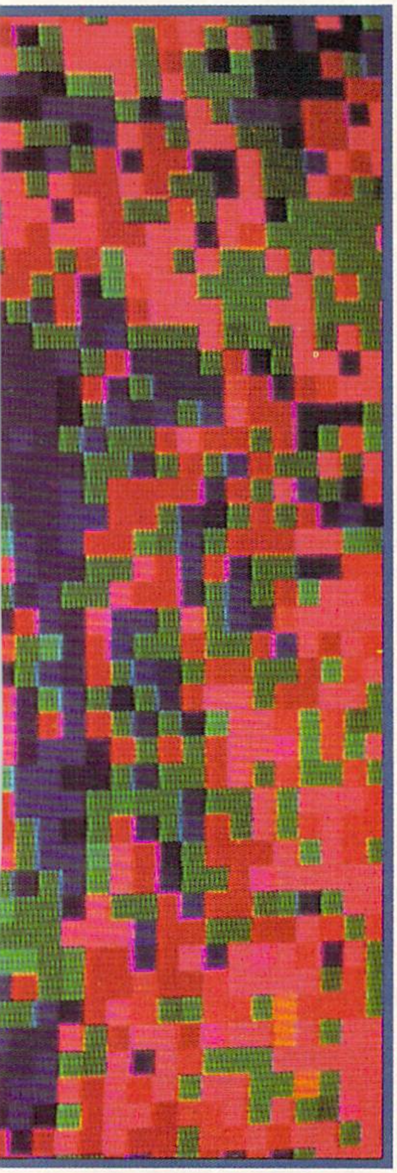
VIDEO DIGITIZERS



WANT A QUICK AND EASY WAY TO OBTAIN GRAPHICS YOUR 64 CAN USE? GET A DIGITIZER.



THE IMAGE BANK

If you're the type who can operate a camera but has trouble drawing a straight line, you'll appreciate a digitizer. With a digitizer and your 64, you can create your own custom graphics without having to master a drawing or painting program.

A digitizer is an electronic device which can convert a photograph, drawing, or video image into digital data (binary numbers) that can be stored and manipulated by your computer. These images can then be sent to a printer, combined with documents, or used as you'd use any other computer graphic.

There are two types of digitizers available for the 64. One is a scanner, an optical device used primarily for digitizing artwork, photographs, or other flat or printed material. (See "Take a Scan at This," an article about the Handyscanner 64, in our December 1990 issue.) The other type—the kind we'll examine in this article—works with a video signal, such as you might get from a video camera.

Video digitizers that operate with the 64 are not finicky; they'll accept a standard composite video signal from just about any video source, including camcorders, VCRs, and laser-disc players. Users must supply their own cameras or other video sources with the digitizers examined here.

Digitizers discussed in this article—ComputerEyes from Digital Vision and Video Byte II from the Soft Group—consist of cartridges that plug into the 64's user port, appropriate software, and instructions.

As a video signal enters a digitizer for processing, it requires from several seconds to as much as two minutes to digitize an image. These currently available video digitizers for the 64 are of the slow-scan variety. Even three seconds is a relatively long time in the video world, since a standard video display is completely updated at a rate of 30 frames per second.

If you work with either of these, in view of their slow-scan operation, a good freeze-frame feature on a VCR would be helpful. Since these digitizers work in black-and-white, a low-cost security camera would be a good choice for a video source. A simple black-and-white camera may even have a higher resolution than any of the color sources mentioned above.

ComputerEyes

ComputerEyes consists of a hardware module, which plugs into the computer's user port, and supporting software on disk. Input of a video signal is through a standard RCA-type phone jack located on the side of the module's case. Two adjustments are provided; the first synchronizes ComputerEyes to your video source. This setting is easily done with the help of the supporting software. The second adjustment compensates for the brightness of the image or the intensity of the video signal. This rather sensitive setting has a direct bearing on the overall appearance of the image. A special scan mode lets you make a coarse adjustment of this control. The fine adjustment will have to be done very carefully by trial and error during the actual digitization process for best results.

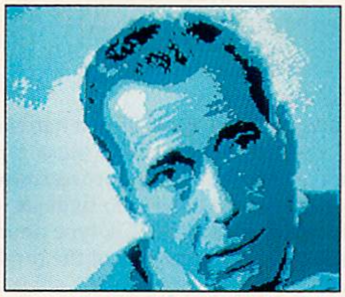
The menu-driven software lets you capture an image in several formats. A single scan digitization creates a high-contrast black-and-white image in about six seconds. Four-level and eight-level captures can also be performed, requiring about 25 seconds and 50 seconds to complete, respectively.

All of the images are pure 8000-byte bitmaps in the 64's high-resolution mode, which results in an image that is 320 pixels wide by 200 pixels high. The separate color data, which is always black-and-white, is not saved to disk; instead, the gray levels are generated by dithering the pixels. This type of bitmap image is well suited for printing with a dot-matrix printer.

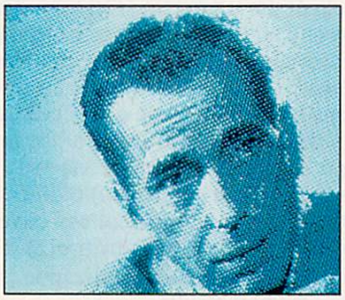
Although you can use the digitized images in your own programs, the basic ComputerEyes software doesn't save the images in a format compatible with any of the commercial graphics packages available for the 64. To generate a compatible file format with ComputerEyes, you'll also have to buy one or more of Digital Vision's compatibility modules.

Compatibility modules are available for a variety of graphics programs. The high-resolution modules support *Doodle-* and *Flexidraw*-format files. These modules add low-contrast and high-contrast capture modes to the three modes already built into the basic software. These extra capture modes make use of all five of the 64's gray levels (black, white,

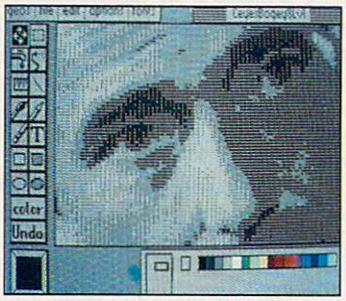
MORTON A. KEVELSON



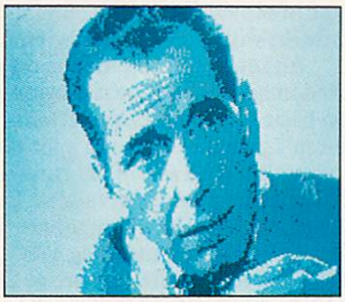
This is a ComputerEyes four-level capture in Koala format.



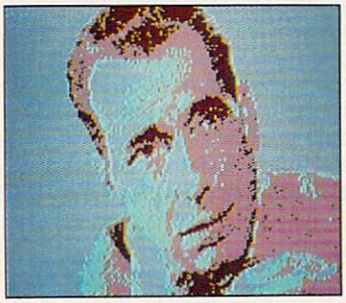
Here's a ComputerEyes eight-level capture in *Doodle* format.



The *GEOS* ComputerEyes driver is available from Quantum Link.



Video Byte can capture an image in about three seconds.



Video Byte can create pseudocolor images in Koala format.

and three shades of gray). Since these modes don't rely on bitmap dithering to generate their shading, they have more detail and finer gradation than the basic capture modes.

The multicolor module supports the Koala file format. Images in the 64's multicolor display mode are only 160 pixels by 200 pixels. The 64 trades off the lower resolution of the image for greater color flexibility in the display. As a result, the gray-scale captures in Koala format can produce a more natural-looking screen display than any of the high-resolution capture modes.

ComputerEyes compatibility modules are also available for capturing clip-art images that can be used with *The Print Shop* and *The Newsroom* page-layout programs. *GEOS* users have access to what is arguably the best ComputerEyes compatibility module. The *GEOS* ComputerEyes driver, which was created by Berkeley Softworks, is available for downloading from Quantum Link, or on disk from *Geoworld* magazine. This driver creates super bitmaps that are 640 pixels wide by 400 pixels high. The images are saved to disk in *geoPaint* format. Three scan modes are available: a high-contrast black-and-white mode, a four-level dithered gray-scale mode, and an eight-level dithered gray-scale mode. The four-level and eight-level modes produce images that print out very well. Scanning times are approximately 20 seconds, one minute, and two minutes, respectively, for the three *GEOS* capture modes.

If you're interested in buying ComputerEyes, you'll have to hustle to get one. Digital Vision has indicated that it's ceased production of the 64 version of ComputerEyes. It will no longer be available once the current stock of hardware and software runs out, although Digital Vision will continue to provide user support as required. Used cartridges should be available from private sources.

Video Byte II

Video Byte II from the Soft Group consists of supporting software and a standard-size 64 cartridge that plugs into the computer's user port. The video signal is fed in via a three-foot length of shielded cable, which terminates in a standard RCA-type phone plug.

There are no external adjustments, since the unit comes preset from the factory for a standard video signal. The lack of external adjustments could be a problem if your video source is slightly out of calibration. One solution is to buy a low-cost video enhancer to adjust the level of the signal. If you're the adventurous sort and don't mind violating your warranty, you can pry open the Video Byte plastic cartridge to make adjustments. Inside are both coarse and fine adjustments for the video signal level.

The menu-driven software lets you capture an image in only the multicolor format, which is 160 pixels wide by 200 pixels high. The initial scan is in black-and-white, using four of the five available gray levels (black, white, and two shades of gray). The image capture time is only about three seconds. The short scanning time makes it possible for Video Byte to digitize live video if the action is relatively calm.

The software lets you adjust the overall tone of the image by shifting it into the third shade of gray. The software can also generate pseudocolor images by cycling through the 16 available screen colors. Colors can be cycled either one at a time or with all four colors at once. The digitized images are saved to disk in Koala format.

Video Byte can keep two digitized images in memory at once. The color map of the displayed image can also be stored for subsequent recall. This lets you quickly restore the original appearance of the image in case you've drastically modified it by the program's color controls.

Conclusions

ComputerEyes and Video Byte II produce comparable images in multicolor format, which are suitable for display on the monitor or for modification with a paint program. Video Byte's three-second capture makes it the one to use for digitizing live video. ComputerEyes is the more versatile unit, as it supports both of the 64's graphic display modes and a variety of file formats. *GEOS* users in particular will find that ComputerEyes can be a good source of clip art for their projects.

On the other hand, Video Byte is still readily available and sells for about $50 less than ComputerEyes. For the money you save, you might want to invest in the Soft Group's Explode V.5 cartridge. This disk drive and printer cartridge allow you to print pictures both in color and sideways on your color dot-matrix printer. ⊡

COMPUTEREYES—$129.95
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270 Bridge St.
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(617) 329-5400

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KEYBOARD art

All graphics are not created equal. High-resolution and multicolor graphics get all the praise and respect, but what about low-resolution (lo-res) graphics? They're the Rodney Dangerfield of graphics.

Lo-res graphics may not get much respect from serious computer artists, but they can be fun. Lo-res art is not as beautiful or as complicated as hi-res and med-res art, but it's quick and easy on a 64 or 128, and it's right there on your keyboard.

The standard letter and number keys provide 40 or so characters, including +, -, <, >, and /, but there are another 56 graphics characters available to Commodore users. These symbols, which you see printed on the front of many keys, can be accessed by pressing either the Shift key or the Commodore key while depressing the desired key. For example, in immediate mode you can create a circle by pressing the Shift key and the U and I keys, pressing Return, cursoring up to the line just beneath the semicircle you've just created, holding down the Shift key again, and pressing J and K to complete the circle.

Screen-capture programs such as *Printmaker* (*COMPUTE's Gazette,* January 1986) and *Screen Store* (May 1990) can be used to design a lo-res display. For many beginning programmers, however, the simplest approach could be typing the graphics directly into a BASIC program.

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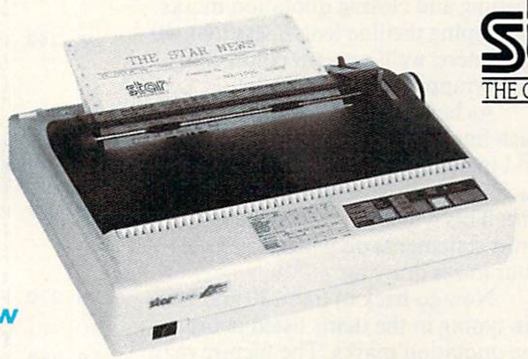

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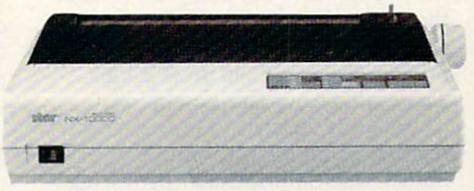

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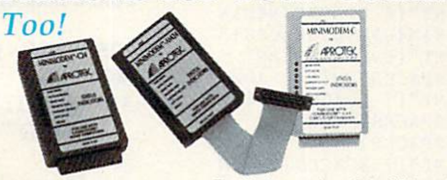

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Circle Reader Service Number 170

Let's create a simple face to begin with; then we'll try something larger. Start by creating six lines of print statements with ten spaces between the quotation marks. Type in the following line and then press Return.

10 PRINT"(10 SPACES)"

To quickly duplicate this line, cursor up to the 10, type 20, and Return. Repeat this process, changing the number each time, until you have six lines numbered 10–60.

Now list your program. These six blank lines will be your workscreen for creating a lo-res drawing. Cursor up to line 10, and just to the right of the first quotation mark, hold down the Commodore key and press A and then S. Cursor to the right five spaces and press Commodore-A and Commodore-S again. Then press Return. These will be our face's eyebrows.

On line 20, start to the right of the first quotation mark and press Shift-U and Shift-I. Cursor five spaces to the right and press Shift-U and Shift-I again, followed by Return. These will form the top halves of the eyes.

On line 30, complete the eye by pressing Shift-J and Shift-K. Then move one space followed by a Shift-M, a space, a Shift-N, a space, and then Shift-J, Shift-K, and Return.

On line 40 we'll continue the nose. From the first quotation mark, cursor over four spaces and press Shift-Y, space, Shift-T, and Return.

On line 50, move in four spaces and press Shift-J, space, Shift-K, and Return to complete the nose.

On line 60 we'll create a mouth by moving in two spaces from the first quotation mark and, while depressing the Commodore key, pressing Q, E, R, E, R, E, and W. Then press Return.

By this time you should be able to see the simple face you've drawn in the listing. Now run the program and see if a face appears. In case you got lost in the previous instructions, here's the listing in our usual format.

```
KR 10 PRINT"{A}{S}{5 SPACES}
       {A}{S} "
BC 20 PRINT"UI{5 SPACES}UI "
SH 30 PRINT"JK M N JK "
EF 40 PRINT"{3 SPACES}Y T
       {4 SPACES}"
MH 50 PRINT"{3 SPACES}J K
       {4 SPACES}"
GQ 60 PRINT" {Q}{E}{R}{E}{R}
       {E}{W}{2 SPACES}"
```

With a few simple modifications, a FOR-NEXT loop, and a delay to slow the action, you could easily make the face blink its eyes or change its expression. You might want to try adding color to your design. This will require heavy use of the Inst/Del key. Doing a drawing in this order, however, keeps it from getting too confusing when you start to modify it. Of course, text can be added at any point to turn your sketch into a title screen. Touches like these are limited only by your imagination.

Now let's try a bigger example by drawing a polar bear. First, set up 20 lines of print statements as you did earlier, but this time start from 130 and insert 25 spaces between the opening and closing quotation marks. By keeping the line length less than 40 characters, we'll prevent confusion with wrapping lines.

As before, instead of typing in each line 20 times, just cursor back and increase the line numbers by 10 each time, pressing Return after each one. This will give you a screenful of print statements on which to create your lo-res drawing.

Now go back to line 130 and begin typing in the items listed between the quotation marks. The picture may be difficult to discern from this listing, but it should appear in your print statements as you type them in. The Shift key and the Commodore key are used quite frequently.

```
HH 100 POKE53280,15:POKE53281,
        15
BF 110 REM BY DON RADLER
RG 120 PRINT"{CLR}{DOWN}
        {6 SPACES}POLAR BEAR
        {DOWN}
CM 130 PRINT"{6 SPACES}N{U}N
        {4 Y}M{U}M{8 SPACES}"
KF 140 PRINT"{6 SPACES}MN
        {6 SPACES}MN{8 SPACES}"
BH 150 PRINT"{7 SPACES}{H}NP
        {2 SPACES}OM{N}
        {9 SPACES}"
HX 160 PRINT"{7 SPACES}{H}0N
        {2 SPACES}M0{N}
        {9 SPACES}"
CM 170 PRINT"{7 SPACES}{H}
        {2 SPACES}UI{2 SPACES}
        {N}{9 SPACES}"
BA 180 PRINT"{7 SPACES}M
        {2 SPACES}JK{2 SPACES}N
        {9 SPACES}"
RX 190 PRINT"{6 SPACES}N M JK
        {SPACE}N M{8 SPACES}"
BC 200 PRINT"{5 SPACES}N
        {3 SPACES}{Y}PO{Y}
        {3 SPACES}M{7 SPACES}"
QC 210 PRINT"{4 SPACES}N
        {12 SPACES}M{6 SPACES}"
AJ 220 PRINT"{4 SPACES}{H}
        {3 SPACES}{H}{4 SPACES}
        {N}{3 SPACES}{N}
        {6 SPACES}"
QJ 230 PRINT"{4 SPACES}{H}
        {3 SPACES}M{4 SPACES}N
        {3 SPACES}{N}{6 SPACES}
        "
HK 240 PRINT"{4 SPACES}{H}
        {4 SPACES}M{2 SPACES}N
        {4 SPACES}{N}{6 SPACES}
        "
GH 250 PRINT"{4 SPACES}{H}M
        {2 P}{2 SPACES}MN
        {2 SPACES}{2 P}N{N}
        {6 SPACES}"
AM 260 PRINT"{4 SPACES}M
        {3 SPACES}M {M}{H} N
        {3 SPACES}N {3 @}
        {2 SPACES}"
XB 270 PRINT" {2 T} N{2 U}M{M}
         {M}{H} {H}N{2 U}M
        {4 @} "
AR 280 PRINT"{4 SPACES}{H}
        {2 SPACES}{N}{2 SPACES}
        NM{2 SPACES}{H}
        {2 SPACES}{N}{6 SPACES}
        "
EX 290 PRINT"{4 I}L{2 R}@M
        {4 P}NL{2 R}@{6 I}"
```

Once you have your basic drawing, it's easy to add a little action. For example, add a simple FOR-NEXT loop and a line of text to show how cold a bear can be.

125 FORI=1TO6
300 NEXT
310 PRINT: PRINT"GOSH, IT'S COLD!"

Elegant? No. Sophisticated? Not exactly. But with a little thought, you can be quite creative just by tapping a few keys. And it's fun. ◘

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REVIEWS

WORD PROCESSOR UPDATE • VAMPIRE ADVENTURE COMPUTER CHECKS • AWESOME DUDES IN HISTORY

WORD WRITER 5

Everyone has a pet (not necessarily a PET) word processor. It may be the first one you used or perhaps one whose unique features meet your special needs. For most people, learning to use a new word processor is a headache—too much time invested for too little return. Not so with Timeworks' *Word Writer 5*.

Word Writer 4 was a winner. It had all the features found in a good word processor—plus a calculator, a basic outline processor, an expandable 85,000-word spelling checker, a word counter, a basic form-letter printout, a 60,000-word thesaurus, eight ready-made fonts, and the ability to import fonts from *GEOS*.

Word Writer 5 offers these features and more. It has two more fonts, a second macro capability (handy for predefining often-used phrases or functions), automatic linking of files, forced page breaks, letter case change, and variable text layout.

The most significant change is one that takes *Word Writer 5* beyond the standard word processor. It comes with its own Art Library and a converter program that allows you to import graphics from *GEOS* or *Doodle.* Included are two conversion tables and a special program to help you place any graphic in a specific location without a lot of trial and error.

There are a few limitations. While text can be placed to either the right or left of a graphic, it cannot flow around a graphic. Two graphics can't be placed side by side. Still, it's an excellent way to handle small jobs without pulling out a desktop publisher.

Two templates and a help screen allow you to work almost manual free, although the manual is thorough and logical. It even includes a segment on understanding your printer—something we all could use a little help with. Quick-Start Mini-Manual lives up to its promise to get you up and running within an hour, and customer support is available by telephone.

My criticism is limited. *Word Writer 5* can skip lines only by repeated Returns. Text-formatting commands can't be strung together on a line, and there's no definable or relative autoindent. On the other hand, some features are accessible in more than one way. Perhaps this duplication could be eliminated, and the freed-up keys could be used for something else. I'd like to see more macros—and see them saved within the text file so that those pertinent to a file would reload with it. A criticism of *Word Writer 4* not addressed in the fifth edition is the lack of a bridge back to the Install program. Since the Install program is where you convert and load fonts and graphics, it would be more convenient to be able to reach it without exiting and reloading the program.

So, what about us sticks-in-the-mud who like our old word processors? Well, truthfully, I still prefer my original one. It has some features that *Word Writer 5* doesn't have, and besides, we understand each other. But is there room in my life for *Word Writer 5?* Yes, because it has font and graphics capabilities not found in most word processors. It's a way station between my word processor and my desktop publisher.

I can heartily recommend *Word Writer 5* to those of you new to word processing. It's a solid product that packs the power of a good word processor and adds the punch of graphics capabilities. There's a place on almost everyone's shelf for *Word Writer 5.*

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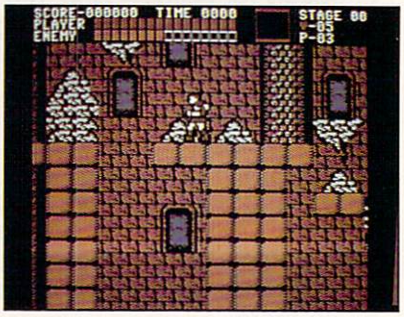
CASTLEVANIA

CastleVania is the latest example of a Konami conversion from an arcade game to a hit for the home computer. This game is very easy to learn, but at times its challenge has made me ready to smash my joystick.



In *CastleVania,* you are a relentless adventurer trying to destroy the evil Count Dracula in his castle. In order to reach the Count, you must make your way through six progressively more difficult levels of his castle. Along the way, you fight bats, skeletons, zombies, ghosts, hunchbacks, eagles, and mummies. There are a lot of other creatures in the game, plus a supermonster waiting for you at the end of each level. More than anything, the monsters lend the game its ghoulish fun. I like games that have a lot of different monsters; they break the monotony of trudging through level after level. *CastleVania* is far from monotonous.

You view *CastleVania* from a third-person perspective, moving your character up and down steps and over obstacles. Joystick response is very good, but some levels require the utmost concentration and control that even this game expert found nerve-racking. I finally gave up on stage 10 to write this review, but I'm going back to beat it later. That's the appeal of *CastleVania;* it does warrant replay.

One part of a game that often goes overlooked is the manual. *CastleVania's* manual is humorous and contains a lot of helpful information. The most important part of the manual is its list of objects that you'll find in the game and a description of how to use them. Kudos to Konami for this.

CastleVania's graphics are a little on the fuzzy side. That doesn't affect gameplay in any way, though. The music is riveting, and sound effects are good. Sometimes I turn off the sound to prevent it from making me any more tense. Overall, I find *CastleVania* to be a fun and challenging game. It adds another winner to the solid track record for Konami in the home computer game market.

RUSS CECCOLA

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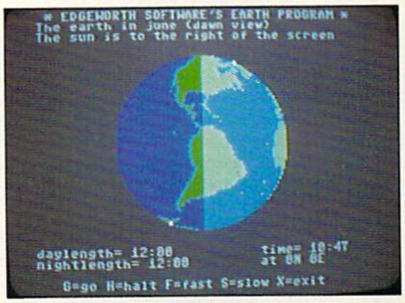
EARTH DISK ONE

When I first got this disk, I thought it was going to be just another educational program like the ones I've used in school. I expected it to be really boring. Was I surprised to find a geography program that was this much fun!



```
* EDGEWORTH SOFTWARE'S EARTH PROGRAM *
The earth in june (dawn view)
The sun is to the right of the screen

daylength= 12:00                 time= 10:47
nightlength= 12:00               at 0N 0E
       G=go H=halt F=fast S=slow X=exit
```

I like *Earth Disk One* because it makes learning geography fun. It does this by showing you a 3-D, spinning globe with nice graphics. I also like *Earth Disk One* because it's easy to use—it took me only about three minutes to learn how to use it.

After I loaded *Earth Disk One,* a menu appeared on the screen. The menu is very well written and easy to use. There are detailed instructions on how to use the program's five different modes. After reading all of the directions, I chose to go to the control screen.

From the control screen, you can choose to look at the Earth during each of its four seasons. You can also look at the Earth from seven different views: dawn, dusk, day, night, north, south, and plain view. And you can choose to see latitude and longitude lines, as well as the poles.

Next, I decided to see some of the graphics. *Earth Disk One* has the best graphics I've ever seen on any geography program. I certainly wasn't expecting a 3-D globe that actually spins on its axis. A feature of the graphics mode lets you see the length of days

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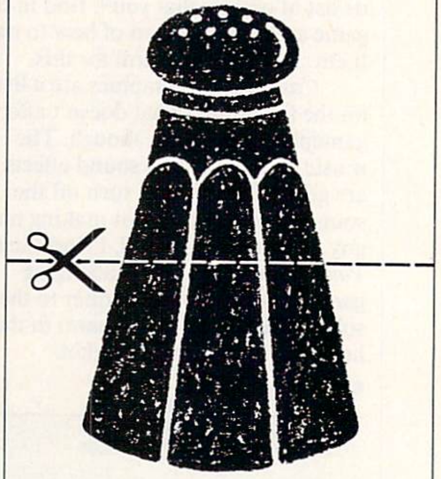
Go against the grain. Cut down on salt.

Adding salt to your food could subtract years from your life. Because in some people salt contributes to high blood pressure, a condition that increases your risk of heart disease.



American Heart Association

and nights for different latitudes and longitudes. Another option lets you change the colors, which is entertaining but not important.

After looking at the graphics, I decided to check out the quiz mode. It lets you select from seven quizzes, with four questions in each quiz. One frustrating thing about the quiz mode is that you can't tell which questions you got right and which ones you got wrong—you're given your score, but regrettably, you aren't told the correct answers.

The information mode gives you facts about the physical features of the Earth. Unfortunately, you have to know a lot about geography to understand the information; plus, it doesn't help you much with the quizzes. In fact, the program suggests using an atlas to find most of the answers to the questions in the quizzes.

Edgeworth Software put a lot of effort into creating this game. Of all the educational games I've played, which is quite a few, this one is the best. It helps you learn geography while having fun at the same time. This is the first educational program I've ever really liked. I recommend *Earth Disk One* to anyone who is studying geography or who just wants to have fun and learn something at the same time.

DOUGLAS BOLE

Commodore 64 or 128—$19.95

EDGEWORTH SOFTWARE
44 Bower St.
Bedford MK403RE
England

BILL AND TED'S EXCELLENT ADVENTURE

In a most bodacious and ultracool move, Capstone Software has brought to computer-gaming dudes everywhere a most excellent way to travel through time with *Bill and Ted's Excellent Adventure.* This arcade/action adventure is loosely based on the popular movie of the same name.

Bill S. Preston, Esquire, and Ted (Theodore) Logan are truly righteous high school dudes who find themselves in the most heinous predicament of failing history class. Their limited knowledge of historical facts and figures prompts them to reply to comprehensive essay questions with answers such as, "Napoleon is a short, dead dude!" To reverse their sliding grade average and avoid the impending doom that will surely follow failure, Bill and Ted must earn a "most triumphant" A+ on their final oral exam.

At the neighborhood Circle K, our heroes meet Rufus, a messenger from the future who shows them how to use a modified telephone booth for time travel. Their mission (and yours) is to travel through time and space to locate historical dudes and bring them back for the final exam.

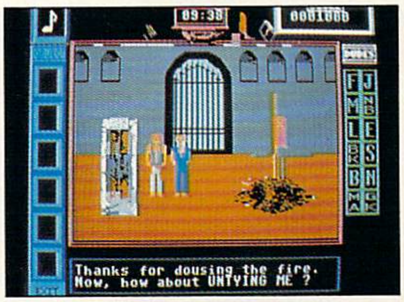
Using the game's small, yellow telephone book, Circuits of Time Directory, you input a year to travel to different periods in world history. Depending on the level of difficulty, you help Bill and Ted bag the necessary number of historical dudes (and dudettes) to pass history class. Some of the famous dudes follow you back to the phone booth as soon as you locate them. Others you must coax into coming back by offering them something they want or need. You'll find these useful items scattered throughout time, so it's a good idea to collect interesting stuff when you come across it. For example, Joan of Arc (Miss of Arc to you) is tied to a burning stake when you find her in the year 1429. If you have the forethought to collect a fire extinguisher, you can save her and perhaps your grade.

Traveling to 410 B.C. gives you the opportunity to bag the noted philosopher Socrates—providing you can answer the question the old Greek dude poses. Helping Billy the Kid in a saloon fight in 1878 will convince him you're his friend, as will rescuing Marie Antoinette from a maze in a palace dungeon in 1793.

Only two historical dudes at a time can travel with you to the present, so it will be necessary to make several trips back to home base at the San Dimas Mall. Once the appropriate quota of famous dead dudes has been assembled, Ted's young and curvaceous Mom, Missie, will pick everyone up and provide a ride to school.

Al Einstein said time is relative. This is true even when speeding through the circuits of time in a telephone booth. The sooner the historical dudes are collected and presented at school, the better the grade you receive. This can be made totally not easy by selecting the most difficult of the four levels of play.

Touted as an arcade/action adventure, *Bill and Ted's Excellent Adventure* leans more toward arcade fun than mind-boggling adventure. My ten-year-old dude had little trouble zapping himself through history.



Thanks for dousing the fire.
Now, how about UNTYING ME ?

Although the graphics pictured on the box look awesome (obviously IBM format), the programmers could've paid more attention to the graphics in the 64 version. A much better effort is exhibited with the sound—as the music and speech are totally way cool.

STEVE HEDRICK

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CHECKBOOK

Everyone uses a checkbook, right? Well, nearly everyone. At least we all know what one is used for. It's a convenient way to pay bills without having to carry a lot of cash.

You write checks to pay bills, record what you spend, deposit funds in the bank to cover the checks, and then hope that your figures balance with the bank statement when it arrives every month.

When your bank statement arrives, you must note service charges, earned interest (if your account is one that earns it), and interest charges on deposits made to your account by the bank (if you have an account with overdraft protection). At the end of the tax year, you start looking for records of payment for different expenses—that's when a well-maintained checkbook is a necessity.

Checkbook, from Computer Craftware, takes care of all of those details and more. Its manual gives clear instructions on how to set up a checking account and make good use of the features available. You enter the amount and the payee, whom you can indicate using a two-letter code. That gives you *AA* to *ZZ*—plenty of room for all categories.

To act as a reminder, a list of checks that you should write every month is available with one keystroke. Automatic payments are entered on the date you specify. When you receive your monthly bank statement, you mark those checks that have cleared, and *Checkbook* does the rest. Detailed lists showing those checks issued to different payees are available anytime.

The program uses Commodore commands for easy editing. Cursor keys allow full-screen editing. The bottom screen line tells you what you can do next. Menus give you all the options, and a simple two-key combination makes it easy to make selections. A utility menu offers everything from formatting a disk to changing the colors on the screen. A simple printer menu covers everything to make the program compatible with your printer.

And if you do write a great number of checks and would like the program to print those, that option is available. The 128 version makes use of the 80-column screen. You'll need a separate disk for each *Checkbook* file if you're using a 1541 or 1571, but instructions are given for using the 1581 with partitions.

The program even shows a highlighted colored bar to alert you to the fact that you'll be overdrawn if you process a current check. It seems as though Computer Craftware has covered everything except how I can deposit more money into my account.

ESTHER OLSON

Commodore 64 or 128—$34.95

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GHOSTBUSTERS II

Although the computer version of *Ghostbusters II* may disappoint admirers of the original, many will feel that the current offering provides more varied gameplay than did its predecessor.

For one thing, the game takes place in three different settings. In your first mission, you must descend into the Van Horne transit tunnel via cable, make it to the bottom alive, assemble a slime scooper by collecting the necessary pieces, and scoop up a gooey sample. You'll need the slime later to defeat the bloodthirsty Vigo.

Complicating matters are strength-sapping ghosts and falling rocks. Watch out for spirits who will saw away at your cable until it breaks, hurling you to your death. Defensive options include dodging and using a shield. Firing proton beams and setting off PKR bombs are your offensive choices.

You'll find this segment difficult at first for several reasons: sloppy joystick response, particularly when trying to collect objects; the awkwardness of using the joystick and keyboard simultaneously; and the failure of the manual to explain how to scoop up slime. After you've mastered this level, you'll wish there were a way to bypass it so that you could proceed immediately to greater challenges.

On Broadway, you control both the Statue of Liberty (by joystick) and your team of Ghostbusters (by keyboard). Your destination is the Museum of Art, where you'll confront Vigo. To arrive safety, you (as Miss Liberty) must travel through a horizontally scrolling screen, shooting fireballs from your torch at endless waves of ghoulish attackers. At the same time, as the Ghostbusters, you have to run out and mop up the remains of your assailants to help replenish Miss Liberty's strength.

Making it through will be a lot easier for two players working together. For a single player, handling both Miss Liberty and the Ghostbusters will be quite a chore.

In the museum, all four of the Ghostbusters have to climb down a rope to the gallery without falling off. Then they must choose appropriate weapons, activate various Ghostbusters, rescue a kidnapped baby from Vigo's clutches, dispatch all humans under Vigo's control, and defeat the evil genius by trapping him in cross fire.

Success requires almost superhuman manipulation of the joystick, space bar, and Return key. Adding to the difficulty are the hazy graphics—the weakest in the game—and the sheer volume of chores to be performed. A more reasonable approach would've been to add a fourth scenario featuring some of the museum's challenges.

Owners of 64s expecting the Amiga-style digitized graphics displayed on *GBII's* packaging will be disappointed. Nevertheless, most of the artwork is attractive and clear, and the animation is graceful.

Extremely annoying are the lengthy reboots required after you've been killed. This is particularly frustrating in the museum segment, where an early demise is the natural state of affairs.

Still, *Ghostbusters II* is mildly diverting entertainment. While it isn't worth writing home about, it doesn't deserve to be completely written off, either.

LEN POGGIALI

Commodore 64 or 128—$29.95

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FEEDBACK

QUESTIONS FROM OUR READERS

Down Periscope

I am writing to let you know that *Periscope* and *Periscope II* are trademarks owned by the Periscope Company. These products are debuggers for use in programming the IBM PC. *COMPUTE* and *COMPUTE!'s Gazette* have published programs of the same name. Our attorney has advised us that we must ask you to change the name of your programs in order to protect our ownership of the trademark.

SHARON BAILEY, VICE PRESIDENT
THE PERISCOPE CO.
ATLANTA, GA

We are more than happy to comply with your request. Since our similarly named programs are disk-sector editors, we'll change the name to SectEd. *We regret any inconvenience or confusion that may have resulted from the inadvertent duplication of program names.*

Bug-Swatter

SectEd 64, *formerly known as* Periscope II *(February 1991), has two typos in the listing that create syntax errors during sector edits. Lines 420 and 450 each begin with IF INCOS. The COS should be replaced by an equal sign, making each line begin IFIN=.*

Line 690 of Pharaoh's Revenge *(November 1990) is too long to enter as printed. Here's the correct listing.*

```
QP 690 PRINTSPC(N)"{RVS}{5}£"
       ;:FORJ=0TOKI/2:PRINT"
       {RVS}{T}";:NEXT
```

Under the Menu

Many programs for the 128 use pop-up menus. After a menu disappears, the information that was underneath it returns to the screen. I've tried listing the programs to see how they do it, but all of these programs are written in machine language. Could you tell me how they do this using BASIC and maybe include a short demonstration program?

H. H. FELTY JR.
WINSTON-SALEM, NC

Pop-up menus don't actually cover underlying text. Instead, the program saves the part of the screen that will be affected before the menu pops up. The saved portion of the screen is then restored when it's time to exit the menu.

For a program to help you create windows to your own programs, check out Window Wizard *(September 1986). If you don't have access to that issue, try the following BASIC code. It writes a screenful of text, saves the region where the window will go, draws the window, and then restores the screen after a key has been pressed. Line 10 dimensions arrays for holding the screen characters and colors. Line 30 uses the subroutine at lines 160–200 to print the main screen. Lines 40–70 read the screen data from where the window will be and color data for that region from color memory. The window data is written in a different color at line 90. Line 100 waits for a keypress. And lines 110–140 restore the original screen data and color.*

```
JR 10 DIM DD(13,20):DIM CL(13,
      20):POKE 53280,0:POKE 53
      281,0
KS 20 A$="COMPUTE ":PRINT CHR$
      (147);CHR$(150)
BB 30 WW=39:FOR X=1 TO 23:GOSU
      B 160:NEXT
QH 40 FOR X=1 TO 13:FOR Y=1 TO
       20
DM 50 DD(X,Y)=PEEK(1023+Y+X*40
      )
MF 60 CL(X,Y)=PEEK(55295+Y+X*4
      0)
XH 70 NEXT Y,X
BD 80 A$="WINDOW DATA ":PRINT
      {SPACE}CHR$(19);CHR$(154
      )
FA 90 WW=20:FOR X=1 TO 13:GOSU
      B 160:NEXT
QF 100 GET A$:IF A$="" THEN 10
       0
ES 110 FOR X=1 TO 13:FOR Y=1 T
       O 20
FD 120 POKE 1023+Y+X*40,DD(X,Y
       )
FR 130 POKE 55295+Y+X*40,CL(X,
       Y)
GH 140 NEXT Y,X
GX 150 END
HR 160 Y=INT((X/LEN(A$)-INT(X/
      LEN(A$)))*LEN(A$)+.5)+1
       :C$=A$
QS 170 IF Y>1 THEN B$=MID$(A$,
       Y):C$=B$+LEFT$(A$,Y-1)
SE 180 FOR Z=1 TO 3:C$=C$+C$:N
       EXT
DE 190 PRINT LEFT$(C$,WW)
MC 200 RETURN
```

Custom Characters

I'm interested in customizing the character set of my 64C, but I don't have any idea where the memory locations for the characters are. Could you tell me the location for the character and graphic sets and how my computer determines the location?

HUBERT CHAN
ST. ALBERT, AB
CANADA

The 64C (which, for programming purposes, is simply a 64 with a new case) has its character set at address 53248 ($D000). This is a read only memory (ROM) location. An interesting thing about 64 ROM areas (including BASIC and Kernal ROM) is that numbers poked there are stored in the underlying RAM, but when you peek the same location, only the ROM value is read.

To define your own character set, you'll need to tell the video chip to look at a non-ROM area so that it will "see" the characters that you define. To modify the 64's character set, copy the old character set to the new location in RAM and work with it there. While transferring, remember that the native character set is 512 characters long: two contiguous 256-character groups for the two text modes produced with the Shift and Commodore keys. Each character is 8 bytes in size. The entire character set, then, is 8 × 512, or 4096 (4K) bytes long. A full transfer, with the RAM address symbolized by RAMADR, will look something like this in BASIC:

```
FOR X=0 TO 4095:POKE
  RAMADR+X,PEEK(53248+X)
  :NEXT
```

How do you determine what RAM address to use? There are several possibilities here, but they depend on some additional factors. First, the VIC-II

FEEDBACK

video chip can "see" only 16K of memory at a time. For this reason, the 64's memory is divided up into video banks numbered 0 through 3. It's not advisable to use banks 0 and 3 for experimenting with video information from BASIC because they're located at the system-RAM/low-BASIC-program and ROM areas, respectively (although bank 0 is the default setting).

Of those remaining, bank 1 extends from address 16384 ($4000) to 32767 ($7FFF); bank 2, from 32768 ($8000) to 49151 ($BFFF). Only bank 1 is completely available for BASIC programmers, though some caution must be taken not to overwrite video information with the program or variables. A machine language program is required to get at all of bank 2.

To make the VIC look where you want, set bits 0 and 1 of address 56576 ($DD00) to the desired bank number (bits 0–3 are represented in two-bit binary form as 00, 01, 10, and 11). Also, bits 0 and 1 of address 56578 ($DD02) must both be set, no matter which bank you choose. If the bank number is symbolized by BANK, a BASIC line for changing the video bank looks like this:

```
POKE 56576,(PEEK(56576) AND
  252) OR BANK:POKE 56578,
  PEEK(56578) OR 3
```

Once the bank has been chosen, your custom character set needs a suitable location within the bank. It must be suitable because the character set will be vying for space with text-screen RAM and/or a bitmap (if you choose to use one).

The text screen takes up 1K of memory locatable at any of the 16 possible addresses within the video bank which are evenly divisible by 1024. Another way of putting this is that the possible locations for the screen are some multiple of 1024 added to the starting address of the video bank you've chosen. Store that multiple, as a value from 0 to 15, in the upper four bits of address 53272 ($D018). With the multiple symbolized by N, a BASIC line for doing this is

```
POKE 53272,(PEEK(53272) AND 15)
  + 16*N
```

The VIC is told where to look for the character set in much the same way. Here, the bank offset is in multiples of 2K—full 2048 bytes—in recognition of the fact that most custom character sets will have only one mode. Because there are eight 2K boundary addresses, only three bits are needed to specify which one to use. They are bits 1, 2, and 3 of the same register that signals where the screen is. If N is the needed 2K multiple, select the character location from BASIC by using the following line.

```
POKE 53272,(PEEK(53272) AND
  241) + 2*N
```

Proofreader Error

When loading *The Automatic Proofreader* in 128 mode, I get a syntax error in line 30. I'm sure the program has been entered correctly. Can you help?

HANS SPARREBOOM
TOFIELD, AB
CANADA

Several of these incorrect listings were printed and given to our art department before we noticed the error. We thought they were all replaced with corrected versions, but occasionally one still turns up. In line 30 of The Automatic Proofreader, *replace the word* WAIT *with* GRAPHIC, *and it should work.*

As you may have noticed, we don't always print The Automatic Proofreader *and* MLX *in every issue as we once did. By omitting these, we have more space for program listings. Since these two programs make it much easier to type in our BASIC and machine language programs, we strongly recommend their use. If any new subscribers don't have a copy of these programs, send us a self-addressed, stamped envelope, and we'll see that you get both listings.*

Wrong Info

In the March issue, Rich Mauney asked about getting a program on the June 1990 *Gazette Disk.* According to my user group, the June *Gazette Disk* is not, and never was, available. Could you please clear up this question?

ROBERT L. CLARK
PASO ROBLES, CA

We don't know where your user group got that idea. The June issue was the last COMPUTE!'s Gazette *in its old format, and it had a companion disk just as any other issue. If you were—or your group was—a disk subscriber at that time, you should have received the disk. If you didn't, contact our Greensboro office. That disk and other back issues are available for $9.95, plus $2.00 shipping and handling. We did not publish in July, August, or September, but we were back in business with the October issue.*

Dictionary Cruncher

At one time a reader wrote asking how commercial spelling checkers can have 80,000 words or more in them. The answer had something to do with the coding scheme. Where did I read that? I'm thinking about a similar technique for a RAM-based dictionary for a program I'm working on.

DALE G. HALBACH
COSTA MESA, CA

The "Feedback" letter you referred to was in the January 1989 issue of COMPUTE!'s Gazette. *(We located it using the* Gazette Index *disk.) It concerned the word storage format of the* SpeedCheck *dictionary.* SpeedCheck *uses two special tricks to save disk space. The first is to leave off the starting letter of the word, since all words in a particular alphabetical group begin with the same letter anyway. The second trick separates words by setting the high bit of the last byte (character) of each. Because text characters don't use the high bit, no information is lost, and a byte of storage that would have otherwise been expended on a separator character is saved.*

Form Maker

My 128 does almost everything I need a computer to do. It keeps my finances organized, prints my posters, does my correspondence, and helps educate my children. In spite of all this, there's one thing I see PCs and Macs doing that I cannot. Is there a program that will help me make forms?

ELROY GANDY
GARNISH, NF
CANADA

Check out Business Form Shop *($39.95) from Brøderbund (17 Paul Drive, San Rafael, California 94903). It generates and prints invoices, expense account records, financial statements, and various reports.* ◻

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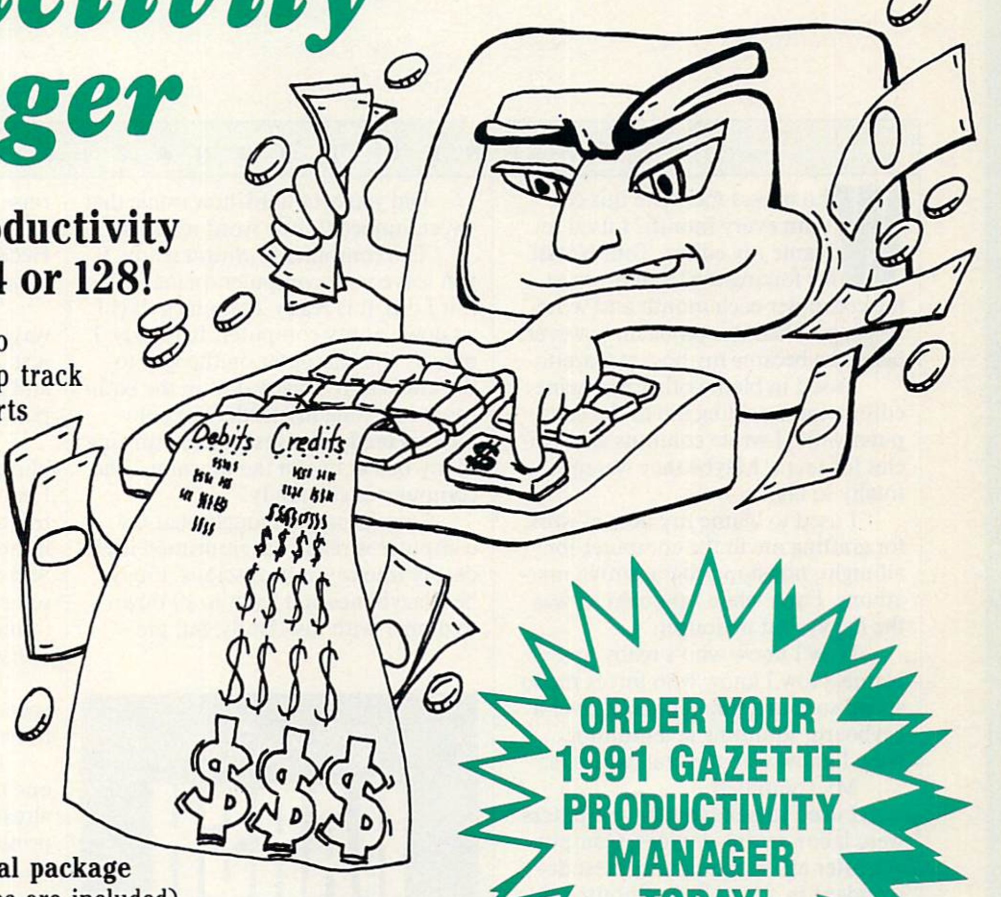

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D'IVERSIONS

MY 64 IS A HARSH MISTRESS

FRED D'IGNAZIO

Who makes me write this column every month? I used to blame my editor, Tom Netsel, for forcing me to sit down at the computer each month and write this page. I had this problem, however, before he became my boss at Gazette.

I used to blame other magazine editors for shackling me to the computer while I wrote columns and articles for them. Maybe they weren't totally to blame.

I used to blame my boss at work for grafting me to the computer for all-night, nonstop programming marathons. For a while I thought he was the heavy, but no longer.

Now I know who's really to blame. Now I know who forces me to spend so much time hunched over a keyboard, squinting at a monitor. Now I know who the real culprit is.

My computer!

I used to believe that computers were labor-saving devices. Computers, after all, were just the latest descendant in a long line of household and office appliances, including vacuum cleaners, refrigerators, copying machines, and microwave ovens. Computers, like other machines, were supposed to make our lives simpler and free us from backbreaking toil.

Now I realize that this is just a myth. The culprit behind this myth is the word *automation.* Computers were supposed to automate work. We were to become the masters, and computers our slaves. We would tell the computer what needed to be done, and the computer would do it. We could sit back and relax while all this work was being performed for us.

Somehow, this master-slave thing got mixed up. Instead of the computer's being the slave, it somehow started acting like the master. Instead of my being the master, I somehow ended up as its slave.

Remember when you started a computer using the BASIC language and when the computer was up and running, it would come back and say, "READY"? That was neat, wasn't it?

Did you ever think how ironic that sweet, innocent little word really is?

The computer is *always* ready. If you leave your computer on (as I admit I do), it is ready 24 hours a day! I sit down at my computer. It's ready. I pass by the computer on the way to the kitchen. It's ready. I'm in the bathroom brushing my teeth. The computer is ready. I'm tossing and turning in my bed at two in the morning. The computer is still ready!

Over time the thought that the computer is ready has imprinted itself deeply into my subconscious. I may be a lazybones and want to sit down to dinner with my family, but the computer is ready. I may want to sack out on the couch and watch a little TV, but the computer is ready. I may want to go ride my bike, catch a movie, or browse in a bookstore, but you-know-who is still ready!

The worst part is that I know it!

It's like the computer has this tiny voice that sings a siren song to me at all hours of the night and day. "I'm ready, Freddie!" it croons softly and sweetly with its little cursor rhythmically tapping its foot on the screen. "I'm here. I'm yours. I'm ready to work, play, do anything I'm capable of doing. All you have to do is sit down and type."

So, big bohunk kind of guy that I am, what do I do? Do I turn my back on the computer and walk away? Do I rinse the computer from my brain and go about living the rest of my life? Heck, no. I'm a wimp! I hear it calling me, and I have to answer.

"Well, OK," I say as I slip sideways into the computer's room. "I'll just type a few lines. Then I'll get up and go do the other things I'm supposed to be doing."

The computer cursor seems to blink with a brighter, perkier beat. Four hours later, where am I? Still sitting at the keyboard, typing just one more line. Still entering more data. Still drawing just one more graphics screen. Still playing just one more round of *Tetris, Mario,* or *Computer Solitaire.*

Usually, I can get away with spending so much time with my computer, but not always.

One night I was working on just one more line in a program that was already 26 feet long (I measured the printout). My wife had been hinting all night that she was going to bed soon. She had hinted that it would be nice if I joined her.

Did I pick up on these hints? Huh-uh, and I paid. I really paid. About two in the morning, my poor wife no longer felt in a romantic mood. Insulted, ignored, and just plain mad, she stormed out of the bedroom, down the stairs, and into the kitchen where I was working on the computer.

She threw a pillow at me, which bonked me on the nose. She heaved a big yellow blanket at me, which floated down over my head. "Go ahead!" she cried. "Stay all night with your electronic mistress! See if I care!" She stormed out crying.

As I sat there in the kitchen in a state of shock with the blanket over my head, I began thinking that maybe my wife was right. Maybe she had hit the mark in more ways than one.

To all you fellow wimps out there, be very careful. Your computer mistress (or the male equivalent) can demand so much of your time that there is little time for other things in life. Like your spouse. ◻

MACHINE LANGUAGE

PUTTING IT ALL TOGETHER

ASSEMBLING THE PERFECT ASSEMBLER

JIM BUTTERFIELD

There's a tiny (nonsymbolic) assembler built into most machine language monitors, such as *Supermon.* It allows you to type in mnemonic commands, and it changes them to machine code. For example, if you type A 033C LDA #$04, this instruction will change to A9 04, and the monitor will prompt you with A 033E so you won't need to calculate the address.

That's fine for small programs and for experiments. As you write bigger programs, however, you'll want to buy a full-scale, commercial symbolic assembler. It will make quite a difference in the way you develop programs.

Most people describe full assemblers in terms of mechanical features. In other words, they say how the use of symbols simplifies calculation and speeds program writing. I'll talk about some of these features in a moment, but there's a more important aspect.

With a symbolic assembler, you can save your source code. That's incredibly useful. It means you can go back and adjust your program, adding a bit here, trimming there.

That way, you can easily go through a full development cycle. Write it, test it, and then go back and adjust it as needed. You can start by putting in test-coding that will help you debug. When your program looks good, out goes that extra code.

Over the longer term, you can return to old programs and trim them up for new requirements or new machines. When you do, you'll be grateful for the comment lines that you wrote; they'll help you remember what you had in mind at the time of the original coding.

Symbols help by automatically working out addresses within your program and allowing system calls and hardware registers to be referenced by name rather than by address.

As you write a program, you might want to branch ahead to as-yet-unwritten code. No problem. Give that code a symbolic name. The assembler will expect you to supply code with such a name. If you don't, it will remind you with an undefined symbol message.

Want to figure out the length of a text string? For example, you might have coded a message as a group of bytes. Instead of counting the length of this message, you can have the assembler do it, this way:

```
MESSAGE .byte “GOOD-BYE,
   CRUEL WORLD!”,$0A
MLEN = *−MESSAGE
```

The asterisk means, roughly, "here," so that the phrase *−MESSAGE subtracts the address beyond the end of the string from the address of the string's start. Result: the length of the string. If you ever change the string, the length will be recalculated automatically.

You might use symbols to code SID=$D400 or SID EQU $D400. After such a definition, you would be able to write STA SID+$18 rather than STA $D418. Some programmers find it hard to remember that the SID chip is at memory location $D400 and find the symbolic address is a help. Similarly, they might prefer JSR CHROUT rather than JSR $FFD2.

Comments help you remember what a particular piece of code is intended to do. They can help you spot code as you scan a large listing. Comments are also useful for long-term program maintenance. Weeks or months after your original program is written, you may want to go back to the source. Perhaps you want to revise the program, or perhaps you want to use some of the code in another project. Either way, the comments will remind you of the way the job is organized.

Comments are also useful to help other people read your code. Sometimes they draw attention to interesting coding tricks that might otherwise be missed.

Many assemblers have extra features that are useful for advanced coding. Macros permit canned code to be invoked, often customized for the particular application. A similar feature is the include command, which allows prewritten code to be called into your current project. Conditional assembly allows you to produce several versions of the same program from a single source. For example, you might have a program that assembles two separate versions for the 64 and 128. Some assembler systems come in two pieces: an editor that allows you to write and update source code and an assembler that converts it into the final object program. Others are integrated into a single operating system. There are a couple of assemblers that cleverly use the built-in BASIC editor of Commodore 8-bit machines.

Assembler program packages seem to have erratic availability: in stock, out of production, repackaged, and then extinct. The problem may be that dealers find that such packages don't have a steady market. *Commodore Development Package,* for example, seems to appear and disappear periodically.

If you know other programmers who are using a specific assembler, try to get that one to make it easier to exchange ideas and coding. ⊡

BEGINNER BASIC

LARRY COTTON

BASIC MATH

YOU CAN DO MORE THAN COUNT ON IT

BASIC math on the 64 can range from the extremely simple to the complex. Let's begin a series that explores that range, beginning with the former and working toward the latter. You'll be amazed at how quick and versatile this computer is in solving math problems. All math operations can be performed in either program or immediate mode (with or without line numbers). The four basic math operations are addition (+), subtraction (−), multiplication (*), and division (/). Let's illustrate all four:

```
10 INPUT“FIRST NUMBER”;A
20 PRINT:INPUT“SECOND
NUMBER”;B
30 C=A+B
40 PRINT:PRINTA“+”B“=”C
```

This is the classic way of gathering user input and then performing math operations on it. In the following examples, little or no error checking is provided, so enter logical numbers. Note that the + and = signs are the entities between quotes, not the variables A, B, and C. Therefore, the + and = signs are printed literally, while the variables' values get printed. Here's the same program for subtraction with positive answers:

```
10 INPUT“LARGER NUMBER”;A
20 PRINT:INPUT“SMALLER
   NUMBER”;B
30 IFA=<BTHENPRINTCHR$(147):
   RUN
40 C=A−B
50 PRINT:PRINTA“−”B“=”C
```

This is similar to the first example, with a check at line 30 to ensure positive answers. Here's an example with multiplication and division in one problem:

```
10 INPUT“FIRST NUMBER”;A
20 PRINT:INPUT“SECOND
   NUMBER”;B
30 C=A*B:D=A/B
40 PRINT:PRINTA“X”B“=”C
50 PRINT:PRINTA“/”B“=”D
```

The above problems can be abbreviated slightly by eliminating one variable and by combining the math and printing operations. Here's how line 30 of the first example could look:

```
30 PRINT:PRINTA“+”B“=”A+B
```

Incidentally, addition, subtraction, and division are usually expressed literally and mathematically the same way, as +, −, and /, respectively. Multiplication, however, can be expressed literally as capital X, but the math operator must be the asterisk (*).

Using division, fractions can easily be converted to decimals:

```
10 INPUT“NUMERATOR”;N
20 PRINT:INPUT“DIVISOR”;D
30 A=N/D
40 PRINT:PRINT“DECIMAL
   EQUIVALENT IS”A
```

The BASIC function that instantly takes the square root of a number before you can release your finger from the RETURN key is SQR( ). Here's an easy one for the computer:

```
10 INPUT“NUMBER TO TAKE
   SQUARE ROOT OF”;N
20 S=SQR(N)
30 PRINT:PRINT“SQUARE ROOT
   OF”N“=”S
```

Use the up arrow for exponents:

```
10 INPUT“NUMBER TO SQUARE”;N
20 S=N↑2
30 PRINT:PRINT“SQUARE
   OF”N“=”S
```

Here's a method for determining any root of a number:

```
10 INPUT“NUMBER TO TAKE A
   ROOT OF”;N
20 PRINT:INPUT“WHICH ROOT”;R
30 A=N↑(1/R)
40 PRINT:PRINTR“ROOT OF”N“IS”A
```

Try this by entering 64 and 3 at the prompts; this will yield 4 as the cube (third) root of 64.

Let's use a variant of the above programs in a practical example to calculate how many cubic yards of concrete you'd need for a driveway:

```
10 INPUT“DRIVEWAY LENGTH IN
   FEET”;L
20 PRINT:INPUT“DRIVEWAY
   WIDTH IN FEET”;W
30 PRINT:INPUT“CONCRETE
   THICKNESS IN INCHES”;T
40 T=T/12:REM CONVERT INCHES
   TO FEET
50 CF=L*W*T:CY=CF/27
60 PRINT:PRINT“YOU NEED”CF
   “CUBIC FEET”
70 PRINT:PRINT“OR”CY“CUBIC
   YARDS OF CONCRETE.”
```

Notice the illegal algebraic, but perfectly legal BASIC, operation in line 40. T's first value is input as inches and then converted to feet by dividing by 12 (12 inches per foot). It's OK to change T's value like that as long as you won't ever need the first value of T again in the program. Line 50 multiplies all the feet together to arrive at cubic feet and then converts cubic feet to cubic yards by dividing by 27 (27 cubic feet per cubic yard). To calculate only cubic yards, we could use only one variable, say, C:

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```
50 C=L*W*T:C=C/27
60 PRINT:PRINT"YOU NEED"C
   "CUBIC YARDS OF CONCRETE."
```

Again, C=C/27 makes no algebraic sense, but it's legal in BASIC. I like to minimize the number of variables used in a program, although this practice does make a program somewhat more difficult for you (or anybody else) to understand later.

Math performed with computers is the same math done with calculators, or, for that matter, with pencil and paper. Certain conventions have been adopted which are universal. For instance, in most problems, the math operations are performed from left to right. Keeping that in mind, what's the answer to this problem?

```
12+6−3
```

The answer is 15. And 15 would be the answer also if the numbers were rearranged:

```
−3+6+12
```

Adding and subtracting are commutative; that is, they can be done in any order. Just be sure that the signs stay with the numbers. Multiplication and division are trickier:

```
12/6*3
```

The answer is 6 because in problems which contain only these two operations, the computer will tackle the math from left to right. How about this one, where operations are mixed?

```
4+6/2*3
```

Is it 21? 15? 5? 13? The correct answer is 13, because mixed mathematical operations are traditionally performed in this order: multiplication and division first (left to right), then addition and subtraction. The first letters form the memory aid *My Dear Aunt Sally.* In the problem above, 6 is divided by 2 to get 3; 3 is then multiplied by 3 to get 9; then 9 is added to 4 to get 13. Don't take *My Dear Aunt Sally* too literally—multiplication doesn't take precedence over division, nor does addition take precedence over subtraction. But both multiplication and division do take precedence over either addition or subtraction. Going further, what's the answer to this problem?

```
(3+4)*(5+6)
```

Did you guess 29? No, the answer is 77. To cause the computer to preempt *My Dear Aunt Sally* requires extra effort. Any operations within parentheses take precedence over *My Dear Aunt Sally.* Thus, 3 must be added to 4 to get 7; then 5 is added to 6 to get 11; then 7 and 11 are multiplied to get 77.

Here's a final test. What's the answer to this problem?

```
15↑3/12*4+6*(4+5)
```

This example introduces exponents, which take precedence over other operations. The easiest way to solve it is to enter it with the word PRINT in front and then press RETURN.

That's math in the immediate mode. But before you do that, try to predict an approximate answer.

Although we studied this not long ago, we'll continue our BASIC math series next month with a review of the somewhat arcane, but nevertheless quite useful, trigonometric functions.

Thanks to calculators and computers, trig functions are now a mere keypress away. They're also more accurate than those interpolated from trigonometric tables or calculated with the help of a slide rule. ◻

PROGRAMMER'S PAGE

RANDY THOMPSON

MORE TIPS FROM READERS: STUPID DOS TRICKS

Try this the next time you save a program to disk. Immediately after you enter a filename in a SAVE command but before you enter the closing quotation mark, hold down the Shift key and press the space bar, hold down the Commodore key and type DUDE, hold down the Shift key and press @, and then type the terminating ",8 and press Return. When you list the disk directory, the computer will show the filename with a ,8,1 extension. Now, all you have to do to load and run the program is move the cursor to the first column of the line containing the filename and press Shift-Run/Stop.

STACY OLIVAS
GRAHAM, WA

Instant Disk Status

Type in and run the following program to gain instant access to your 64's disk drive's error status.

```
KE 10 DV=8:SA=49152
MG 20 FOR I=SA TO SA+43:READ D
      :POKE I,D:C=C+D:NEXT:POK
      E SA+9,DV
KD 30 IF C<>6193 THEN PRINT "E
      RROR IN DATA STATEMENTS"
      :END
KC 40 PRINT "TO CHECK DISK STA
      TUS, ENTEP SYS";SA
EE 49152 DATA 169,0,32,189,255
         ,169
KA 49158 DATA 15,168,162,8,32,
         186
MX 49164 DATA 255,32,192,255,1
         62,15
EE 49170 DATA 32,198,255,32,20
         7,255
FM 49176 DATA 32,210,255,201,1
         3,208
CQ 49182 DATA 246,169,15,32,19
         5,255
SR 49188 DATA 32,204,255,169,0
         ,133
XQ 49194 DATA 198,96
```

The next time your disk drive light flashes rudely in your face, type SYS 49152 and hit Return. After consulting with your disk drive, this program echoes the cause of the drive's irritation to the screen.

As presented above, this program returns the error status of the disk drive known as device 8. To modify the program to check a different device, change line 10 so that the variable DV is set equal to another number—such as 9 for device 9—and run the program again. You can also enter the command POKE 49161,*x* after running the program above, where *x* is the desired device number.

This program stores its error-detecting machine language routine in memory starting at 49152. You can change this starting address by changing the value assigned to SA in line 10. If you change the starting address, you must also change the SYS instruction to reflect the routine's new location.

FRANCISCO FELIX
LA PAZ, BAJA CALIFORNIA SUR
MEXICO

Color-Coded Directories

Make your directories more colorful by using the following two commands to format your disks:

OPEN15,8,15,"N0:"+CHR$(141)+CHR$(*x*)+"*name,id*"
CLOSE 15

Name is a disk name comprised of 16 or fewer characters, *id* is any two-character disk identification, and *x* is one of the following color values:

Value	Color	Value	Color
5	white	151	gray 1
28	red	152	gray 2
30	green	153	light green
31	blue	154	light blue
129	orange	155	gray 3
144	black	156	purple
149	brown	158	yellow
150	light red	159	cyan

The directory of the newly formatted disk will list to the screen in the color that you have selected.

MATT L. GATSKIE
AKRON, OH

Two-Line BSAVE

This short BSAVE routine allows 64 owners to save any area of the 64's memory to disk. You can save machine language programs, custom ROM routines, and graphics data.

To use this two-line BSAVE, make F$ equal to the desired filename, DV equal to the drive's device number (usually 8), SA equal to the starting address, and EA equal to the ending address plus one; then GOSUB 1000. Alternatively, you could insert this code anywhere you use it, eliminating the need for the RETURN in the last line.

```
JX 1000 SYS 57812 F$,DV:POKE 1
        73,SA/256:POKE 172,SA-
        PEEK(173)*256:POKE 780
        ,172
XK 1010 POKE 782,EA/256:POKE 7
        81,EA-PEEK(782)*256:SY
        S 65496:RETURN
```

This subroutine is actually very simple in operation. After setting the file parameters using a ROM routine located at 57812 ($E1D4), the subroutine initializes the starting and ending addresses and calls the well-documented Kernal routine, SAVE.

RANDY THOMPSON
TWIN PEAKS, WA

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PROGRAMS

SCICALC 64

TURN YOUR 64 INTO A SCIENTIFIC CALCULATOR

ROBERT ROCKEFELLER

This powerful program turns your 64 into a sophisticated, programmable scientific calculator, with 52 functions, 100 memory registers, and a 50-item stack. Additional functions can be added through the use of BASIC programs and macros to make it even more useful.

SciCalc 64 is an RPN (Reverse Polish Notation) stack-oriented calculator, as opposed to the more common algebraic calculators. RPN is a notation invented by a Polish mathematician. To perform an operation, you first enter onto a stack the number or numbers to be operated on; then you perform the operation. For example, to multiply 5 times 3, you would type 5 and then press the Return key to place the number 5 on the top of the stack. Then type 3 * to place the number 3 on the stack and perform the multiplication. Any operation key such as * performs the function of entering a number onto the stack as well as the function assigned to the key.

Entering the Program

SciCalc 64 is written entirely in machine language, but it loads and runs like a BASIC program. To enter it, use *MLX,* our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts, respond with the following values.

Starting address: 0801
Ending address: 1AB0

When you've finished typing, be sure to save the program before exiting *MLX.*

Getting Started

After you load and run *SciCalc 64,* you may want to practice entering numbers and performing calculations with the following examples.

To compute 342 + 98765
Type 342 Return 98765 +

To compute (5+3)*(6+2)/3
Type 5 Return 3 + 6 Return 2 + * 3 /

To enter a negative number, such as −6, use the back arrow.
Type 6 ←

To compute −(5.393e−5)−3.66
Type 5.393e−5←3.66 −

To compute sin(3↑2/4.66)
Type 3 Return 2 ↑ 4.66 / Ctrl I

Let's look at some conventions regarding use of the keyboard. Some functions are called by pressing a single key, such as F, M, Return, or Del; others require you to press two keys simultaneously. For example, Shift-C means press a Shift key and the C key simultaneously. C=-B indicates that the Commodore logo key at the lower left of the keyboard is to be pressed simultaneously with the B key.

The Stack

The stack is displayed at the top left of the screen. Although the stack can contain 50 numbers, only the first ten entries are displayed. The top two stack entries are labeled *X* and *Y* on the calculator display. These are special because all calculator functions, such as multiplication, addition, sine, cosine, and so on, are performed on one or both entries. Results are also displayed in the X register.

Functions that require one operand (such as sine, cosine, compute logarithm, and square root) operate on the X register (the top stack entry) and display the answer in the X register. Functions that require two operands, such as multiplication, subtraction, and so on, operate on the Y and X registers, displaying the answer in X.

When you enter a number, you'll see a solid cursor on the rightmost character of the top stack entry, indicating input mode. During this mode you can enter the keys 0–9, the decimal point, and E to indicate exponentiation. After entering E, you may press the minus sign to indicate a negative exponent. Except for this one special case with exponents, typing a minus sign will compute a subtraction (Y − X), so be careful. Don't use the minus key to enter a negative number. Type the number first; then press the back-arrow (←) key to change the number's sign.

Pressing the Del key during input mode deletes the last character entered. Pressing Return during input mode terminates input mode and places the number on the stack. Pressing Del when no cursor is displayed deletes the top stack entry. Pressing Return when no cursor is displayed duplicates the top stack entry.

The Memory Registers

The memory registers are displayed at the top right. Although you can store 100 different numbers in memory, only ten are displayed at any one time. Memories 0 to 9 are displayed when the calculator is first started. The other memories can be displayed with the cursor keys. Press cursor-down to display the next lower set of memories. Press cursor-up to display the next higher set of registers.

Mode Indicators

Below the stack display are three boxes labeled *Degrees, Radians,* and *Gradients.* These indicate the format used for such trigonometric functions as sine, arc sine, and so on. A check mark appears beside the current format.

Near the bottom is a box labeled Record. A check mark will appear beside this box when a macro is being recorded. Macros are explained later.

Error Handling

If an error occurs during an operation, an error message will be displayed on the bottom line of the calculator. Press the f1 key to clear it.

BASIC Programs

SciCalc 64 has the ability to keep a number of BASIC programs in memory at the same time. The total number is limited only by the amount of memory available. Memory from hexadecimal address $B000 to $FF00 is used for program storage, which gives about 20224 bytes. You can select among programs stored there and execute them at any time.

Let's demonstrate with an example. Load and run *SciCalc 64*. When the working screen appears, press the X key to exit to the normal BASIC environment. While in this environment, you can perform any normal BASIC function, such as loading, running, or writing programs. You should not run any machine language programs, however. For our demonstration, type in the following short program and save it to disk with the name *Permutations*.

```
10 X=1: IF CS(0)=0 THEN 30
20 FOR A=1 TO CS(0): X=A*X: NEXT
30 CS(0)=X
```

Now type SYS2065 and press Return to restart the calculator. Now load *Permutations* into the calculator. Press C=-L; then type *Permutations* and hit Return at the prompt. To get a list of all BASIC programs loaded into *SciCalc 64*, press C=-B. Currently, *Permutations* is the only one.

Permutations calculates the number of different ways in which *n* objects may be arranged. The formal notation is n!. For example, the letters *A, B,* and *C* may be arranged in six different ways.

ABC ACB BAC BCA CAB CBA
3! = 3 * 2 * 1 = 6

Let's test the program. Type 3, then press the B key, and then enter *Permutations* and a Return to execute the program. The 3 is replaced by 6, showing that the computation was performed correctly. We have added a new function to the calculator, but how does it work?

To execute a program, the calculator searches storage to verify that the program is present in the computer. If the program is not found, an error message is issued. If the program is found, it is copied to BASIC program memory. Then the stack and memory registers are passed to the BASIC program by means of two arrays which are created automatically by the calculator. Array CS(49) is created for the stack, and array CM(99) is created for the memory registers. CS(0) corresponds to the X register (the top of the stack), CS(1) corresponds to Y, and so on. CM(0) corresponds to memory register 0, CM(1) corresponds to memory register 1, and so on. Any change made to either array is reflected in the stack and/or memories when the calculator regains control.

On occasion, you may need to make use of a BASIC program that prints something to the screen and/or uses the INPUT command. Press the C key (clear screen and execute BASIC) for this purpose. The B key (execute BASIC) neither clears the screen before executing nor redraws the calculator screen after BASIC finishes executing. This is beneficial for programs like *Permutations*, since it prevents an annoying screen flash. (A summary of all *SciCalc 64* commands is printed below.)

Macros

In addition to executing and using BASIC programs, *SciCalc 64* possesses another programmable feature known as *macros*. A macro is a list of instructions or commands that the program saves and performs later, saving the user from having to enter them every time that command is used.

To demonstrate, press the R key and then ! followed by Return. Notice that a check mark appears beside the Record box, indicating that a macro is being recorded. Everything you type now will be recorded until you press R again, which terminates recording. Press B, then type *Permutations*, press Return, and then press the R key again.

We have just created a macro named !. To test this macro, press Shift-M. At the prompt, press ! followed by Return. What was just recorded will be played back verbatim. We have created a macro that saves us from a lot of typing when using the *Permutations* program.

Macros execute commands with only a couple of keypresses. Macro names can be up to 16 letters long, but by keeping them short, macros can be executed by typing M and then typing the macro name. For example, type 9 M ! to execute *Permutations* again to see how many permutations there are of nine items.

Let's demonstrate another macro that executes a BASIC program as part of its computations. The formula for the number of unique subsets of size *k* items which can be made from a set of *n* things is as follows:

$$\frac{n!}{k!(n-k)!}$$

This formula has two variables, so we'll adopt the convention that *n* is entered first followed by *k*. Enter 4 and then 3 to put two values to work in the stack. Now press R and type SUBSET followed by a Return to begin recording. Now press the following keys. The explanation of each keystroke follows.

Keys	Function
0 P	put *k* in memory 0
W	swap X and Y
1 P	put *n* in memory 1
W	swap X and Y
—	$n-k$
M !	$(n-k)!$
0 F	fetch *k*
M !	$k!$
*	$k!(n-k)!$
1 F	fetch *n*
M !	$n!$
W	swap X and Y
/	final result
R	end the macro

Note that this macro calls a BASIC program three times and uses the ! macro. Macros can call any number of BASIC programs, can be nested up to ten deep, and can be up to 4090 bytes long. 4096 bytes have been allocated for macro storage.

Numeric Functions

Here's a list of *SciCalc 64*'s numeric functions and their explanations. The results of most operations appear in the X register.

C=-D Set Degrees mode for trigonometric functions.
C=-R Set Radians mode for trigonometric functions.
C=-G Set Gradients mode for trigonometric functions.
← Change the sign of X. For example, 5.5 would become −5.5, and −5.5 would become 5.5.
Shift-A Compute the absolute value of X.
Shift-D Compute the logarithm of X to the base 10. The decimal logarithm of 100 is 2.
Shift-E This returns the value of 10 raised to the exponent X. For example, if X = 2, the value 100 is returned.
Shift-N Compute the logarithm of X to the base *e* (2.718281828). For example, if X = 100, the value 4.605170186 is returned.
Shift-X This returns the value of *e* (2.718281828) raised to the exponent X. For example, if X = 4.605170186, the value 100 is returned.
Shift-T Compute the square root of X.
Shift-Q Compute the square of X.
Shift-I Compute the integer value of X, stripping X of any fractional value. For example, 3.456 would become 3.
Shift-F Compute the fractional value of X, stripping X of any integer value. For example, 3.456 would become 0.456.
Shift-V Compute the reciprocal of X (the value 1/X). For example, 5 would become 1/5 or 0.2.
Shift-3 Compute a random number and put it in the X register. This function is implemented using BASIC's RND(0) function.
Shift-↑ Put the value of pi (π) in the X register.
Ctrl-I Compute the sine of X.
Ctrl-O Compute the cosine of X.
Ctrl-A Compute the tangent of X.
Ctrl-S Compute the inverse or arc sine of X.
Ctrl-C Compute the inverse or arc cosine of X.
Ctrl-G Compute the inverse or arc tangent of X.
* Multiply Y times X.
/ Divide Y by X.
Shift-S Modulus. Divide Y by X. The remainder is left in X. For example, if Y = 9 and X = 5, the result would be 4.
↑ Compute Y to the power X.
Shift-R Compute the Xth root of Y. For example, if Y = 64 and X = 3, the cube root of 64 is returned, namely 4.
+ Add Y to X.
− Subtract X from Y.

Memory Register Commands

F Fetch. Copy a number from a memory register to X. The memory registers are numbered from 0 to 99. Type the number of the register you wish to access; then type F.
P Put. Copy a number from X to a memory register. The memory registers are numbered from 0 to 99. Type the number of the register you wish to store to; then type P.
Cursor Up Display the next higher set of memory registers.
Cursor Down Display the next lower set of memory registers.

Stack Commands

SciCalc 64 implements several functions which allow you to manipulate the stack. They are listed below.

W Swap Y and X. Put the value in X into Y, and vice versa.
O Roll. Move a stack entry into X. The stack entries are numbered from 1 to 49, with 1 the top entry (the X register) and 49 the bottom entry. Entry 50 is inaccessible with the Roll or Pick functions. Type the number of the entry you wish to move into X; then type O. Typing 1 O duplicates the top entry. Typing 2 O is equivalent to the Swap operation.
I Pick. Copy a stack entry into X. The stack entries are numbered from 1 to 49, with 1 the top entry (the X register) and 49 the bottom entry. Entry 50 is inaccessible with the Roll or Pick functions. Type the number of the entry you wish to copy into X; then type I.
Return Press Return when not in input mode to duplicate the top stack entry. If the calculator is in input mode (a cursor is displayed on the top stack entry), press Return to leave input mode; then press Return again to duplicate.
Del Hit Del when not in input mode to delete the top stack entry. If the calculator is in input mode (a cursor is displayed on the top stack entry), press Return to leave input mode; then press Del to delete.

Clear Commands

Shift-Clr These keys clear the calculator, including the stack, memory registers, macros, and BASIC programs. You must type Y and then press Return at a prompt before clearing takes place.
Shift-Inst Use these keys to clear the stack and memory registers. Macros and BASIC programs are untouched. You must type Y and then press Return at a prompt before clearing takes place.

BASIC Programs

C=-L Load a single BASIC program into the calculator. Type the program filename and then press Return. The program is loaded from disk device 8.
C=-S Save all BASIC programs. The calculator can have numerous BASIC programs in memory at the same time. This command saves all the programs currently in memory to disk in one file. The C=-A command can then be used to load this file.
C=-A Load a file of BASIC programs saved with the C=-S command.
C=-B Display a list of all the BASIC programs that have been loaded with C=-L and/or C=-A.
B Execute a BASIC program which has been loaded with C=-L or C=-A. Enter the program name at the prompt.
C Clear the screen; then execute a BASIC program which has been loaded with C=-L or C=-A. Enter the program name at the prompt. After the program finishes executing, the calculator screen will be redrawn.
X Exit to the BASIC environment. While in BASIC, you can perform any normal BASIC operation, such as running or creating programs. Type SYS2065; then press Return to reactivate the calculator.

Macros

R Record a macro. Enter the macro name; then press Return. Enter the information or instructions you want recorded; then press R again to terminate recording.

S Save all defined macros to disk in a single file. Enter the filename at the prompt; then press Return.

L Load macros from disk. Enter the filename at the prompt; then press Return.

Z Define whether or not the screen should be constantly updated when a macro is executing. Type 0 Z to disable screen updating. Type 1 Z to enable it. The default mode is enabled. Macros execute much faster with screen updating disabled, but errors in macro logic are more easily found with screen updating enabled.

C=-M List the names of all defined macros.

Shift-M Execute a macro. Enter the macro name at the prompt; then press Return.

M Execute a one- or two-letter macro name. Type M and then the macro letter(s). This is a convenience for quick execution of often-used macros.

Miscellaneous Commands

Q Quit the calculator. Use this command only when you are finished with the calculator. Type Y at the prompt and then press Return.

D Redraw the calculator screen. ⊡

SCICALC 64

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0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 4C ED 08 D5
0811:4C 07 09 8A 10 03 4C 71 69
0819:08 38 E9 01 48 2C A8 1A E6
0821:10 03 20 93 08 20 E7 14 DB
0829:20 DA 15 68 20 F5 0A 20 36
0831:5E 08 A0 00 8C A9 1A B1 77
0839:FB 08 29 7F 20 D2 FF C8 7B
0841:28 10 F4 20 E7 14 20 7D 57
0849:0D 20 45 52 52 4F 52 00 2A
0851:20 06 15 C9 85 D0 F9 20 B5
0859:D7 0A 4C 2A 09 20 12 0B FB
0861:20 7D 0D 92 D0 D2 C5 D3 DC
0869:D3 20 C6 31 3A 20 00 60 0A
0871:20 93 08 2C A9 1A 10 03 13
0879:20 1A 0B 20 DD 15 A9 00 1A
0881:8D A9 1A 20 90 FF 4C 2A 4F
0889:09 20 A4 0F 20 CD 0D 4C 4A
0891:D7 0A A0 00 8C AB 1D 8C FD
0899:AA 1D 8C AC 1D 8C A8 1A 29
08A1:B1 2F D9 F1 18 F0 01 60 97
08A9:C8 C0 07 90 F3 A9 FC 85 FD
08B1:22 A9 02 85 23 A9 AE 85 78
08B9:F7 A9 1A 85 F8 A5 2F 85 0E
08C1:F9 A5 30 85 FA 08 A9 30 12
08C9:78 85 01 78 A0 00 C4 22 CF
08D1:D0 0C C6 23 10 08 A9 37 83
08D9:85 01 28 A9 FF 60 B1 F9 6B
08E1:91 F7 C8 D0 E9 E6 FA E6 A6
08E9:F8 4C CF 08 20 E7 14 20 EC
08F1:2F 11 A9 00 8D AC 1D 8D F9
08F9:AA 1D 8D AB 1D 8D F6 1D 3D
0901:20 AE 19 20 44 A6 20 72 63
0909:0A A9 14 8D 00 03 A9 08 4D
0911:8D 01 03 A9 71 8D 02 03 ED
0919:A9 08 8D 03 03 20 1A 0B BB
0921:20 99 0F 20 CD 0D 20 D7 48
0929:0A A2 FB 9A 20 F5 14 20 33
0931:36 09 4C 2A 09 AA E0 2E AF
0939:D0 13 2C AA 1D 70 48 20 04
0941:0F 0D B0 43 AD AA 1D 09 C3
0949:40 8D AA 1D 60 E0 45 D0 E7
0951:13 2C AA 1D 30 31 20 0F B4
0959:0D B0 2C AD AA 1D 09 80 DA
0961:8D AA 1D 60 E0 2D D0 16 02
0969:2C AA 1D 10 0D AC AC 1D 72
0971:B9 FF 01 C9 45 D0 03 4C DC
0979:0F 0D 8A 4C 89 09 8A 20 12
0981:E6 0C 90 04 20 0F 0D 60 14
0989:C9 14 D0 35 2C AB 1D 30 6D
0991:06 20 61 0F 4C 27 0E AC 93
0999:AC 1D D0 03 4C 31 0D B9 8E
09A1:FF 01 AE AA 1D F0 14 C9 13
09A9:45 D0 06 8A 29 7F 4C B9 95
09B1:09 C9 2E D0 06 8A 29 BF F9
09B9:8D AA 1D CE AC 1D 4C 31 71
09C1:0D C9 0D D0 11 2C AB 1D 29
09C9:10 06 20 3C 0F 4C 27 0E 33
09D1:20 55 0F 4C 27 0E 20 8D 2F
09D9:0A 90 1F 98 48 20 36 0F C0
09E1:20 9F 0E 68 A8 B9 88 12 83
09E9:8D F9 09 B9 89 12 8D FA A8
09F1:09 20 F8 09 4C 22 0A 4C 8B
09F9:F8 09 20 93 0A 90 2B 98 89
0A01:48 20 36 0F 68 A8 B9 D8 2B
0A09:12 8D F9 09 B9 D9 12 8D 40
0A11:FA 09 20 9F 0E 20 93 0E 09
0A19:20 D6 0E 20 F8 09 20 61 44
0A21:0F 20 C4 0D 20 FF 0E 4C 97
0A29:27 0E 20 87 0A 90 19 98 2E
0A31:48 20 36 0F 68 A8 B9 6C EE
0A39:11 8D F9 09 B9 6D 11 8D 3C
0A41:FA 09 20 F8 09 4C CD 0D CA
0A49:C9 DE D0 10 20 36 0F 20 2D
0A51:55 0F A2 A8 A0 AE 20 A3 56
0A59:0E 4C 22 0A C9 23 F0 01 2A
0A61:60 20 36 0F 20 55 0F A9 83
0A69:00 20 9A E0 4C 22 0A 18 FD
0A71:24 38 A2 03 BD 00 03 B0 CE
0A79:03 BD BC 1D 9D BC 1D 9D 9F
0A81:00 03 CA 10 EF 60 A2 6B 62
0A89:A0 11 D0 0A A2 87 A0 12 73
0A91:D0 04 A2 D7 A0 12 86 FB 37
0A99:84 FC AA A0 00 8A D1 FB 58
0AA1:F0 0A 18 B1 FB F0 05 C8 45
0AA9:C8 C8 D0 F1 8A 60 20 9B 3F
0AB1:BC A5 65 A4 64 60 A9 20 9C
0AB9:4C D2 FF 20 12 0B 20 7D 25
0AC1:0D 92 20 D0 D2 C5 D3 D3 3B
0AC9:20 C1 20 CB C5 D9 20 2E 23
0AD1:2E 2E 00 20 06 15 20 12 61
0AD9:0B 20 FF 0C A9 20 A0 25 70
0AE1:20 D2 FF 88 D0 FA 60 18 8E
0AE9:20 F0 FF 20 7D 0D 92 F0 82
0AF1:0F 20 00 60 AA A9 9E 85 5A
0AF9:FB A9 A1 85 FC A0 00 CA 38
0B01:30 0E B1 FB 48 E6 FB D0 4F
0B09:02 E6 FC 68 10 F4 30 EF A4
0B11:60 A0 01 A2 16 18 4C F0 64
0B19:FF 20 7D 0D 09 0E 08 93 DB
0B21:12 B0 C0 B2 F0 0F C0 B2 A7
0B29:C0 C0 B2 F0 0F C0 B2 AE C4
0B31:0D 12 DD D8 DD F0 0F 20 8C
0B39:DD 20 20 DD F0 0F 20 DD 0A
0B41:DD 0D 12 DD D9 DD F0 0F E0
0B49:20 DD 20 20 DD F0 0F 20 DD
0B51:DD DD 0D 12 DD 20 DD F0 AC
0B59:0F 20 DD 20 20 DD F0 0F 26
0B61:20 DD DD 0D 12 DD 20 DD B1
0B69:F0 0F 20 DD 20 20 DD F0 CB
0B71:0F 20 DD DD 0D 12 DD 20 3D
0B79:DD F0 0F 20 DD 20 20 DD 2C
0B81:F0 0F 20 DD DD 0D 12 DD DA
0B89:20 DD F0 0F 20 DD 20 20 0F
0B91:DD F0 0F 20 DD DD 0D 12 49
0B99:DD 20 DD F0 0F 20 DD 20 46
0BA1:20 DD F0 0F 20 DD DD 0D 8F
0BA9:12 DD 20 DD F0 0F 20 DD 04
0BB1:20 20 DD F0 0F 20 DD DD 3D
0BB9:0D 12 DD 20 DD F0 0F 20 89
0BC1:DD 20 20 DD F0 0F 20 DD 92
0BC9:DD 0D 12 DD 20 DD F0 0F 9B
0BD1:20 DD 20 20 DD F0 0F 20 66
0BD9:DD DD 0D 12 DD 20 AD F0 D4
0BE1:0F C0 BD 20 20 AD F0 0F 12
0BE9:C0 BD DD 0D 12 DD F0 04 4A
0BF1:20 B0 C0 C0 C0 C0 C0 C0 B3
0BF9:C0 C0 C0 AE F0 16 20 DD A1
0C01:0D 12 DD F0 04 20 DD 20 6B
0C09:44 45 47 52 45 45 53 20 A8
0C11:DD F0 16 20 DD 0D 12 DD 3E
0C19:F0 04 20 AB C0 C0 C0 C0 B4
0C21:C0 C0 C0 C0 C0 B3 F0 16 BA
0C29:20 DD 0D 12 DD F0 04 20 66
0C31:DD 20 52 41 44 49 41 4E B6
0C39:53 20 DD F0 16 20 DD 0D C7
0C41:12 DD F0 04 20 AB C0 C0 2A
0C49:C0 C0 C0 C0 C0 C0 C0 B3 54
0C51:F0 16 20 DD 0D 12 DD F0 A6
0C59:04 20 DD 47 52 41 44 49 15
0C61:45 4E 54 53 DD F0 16 20 6E
0C69:DD 0D 12 DD F0 04 20 AB 57
0C71:C0 C0 C0 C0 C0 C0 C0 C0 89
0C79:C0 B3 F0 16 20 DD 0D 12 03
0C81:DD F0 04 20 DD 20 52 45 A0
0C89:43 4F 52 44 20 20 DD F0 D3
0C91:16 20 DD 0D 12 DD F0 04 37
0C99:20 AD C0 C0 C0 C0 C0 C0 9C
0CA1:C0 C0 C0 BD F0 16 20 DD 3C
0CA9:0D 12 AB F0 25 C0 B3 0D F1
0CB1:12 DD F0 25 20 DD 0D 12 5F
0CB9:AD F0 25 C0 BD 0D 20 D2 CA
0CC1:D0 CE 20 C3 41 4C 43 55 4D
0CC9:4C 41 54 4F 52 20 42 59 C8
0CD1:20 D2 4F 42 45 52 54 20 F8
0CD9:D2 4F 43 4B 45 46 45 4C 66
0CE1:4C 45 52 00 60 C9 3A B0 0B
0CE9:03 C9 30 60 18 60 C9 20 F7
0CF1:90 0A C9 80 90 F6 C9 A0 AA
0CF9:90 02 B0 F0 38 60 48 A9 7D
0D01:92 20 D2 FF 68 60 48 A9 C5
0D09:12 20 D2 FF 68 60 8A 2C 94
0D11:AB 1D 30 0E CE AB 1D 48 D6
0D19:20 55 0F 20 27 0E 20 7A A8
0D21:0F 68 AC AC 1D C0 0F 90 D7
0D29:01 60 99 00 02 EE AC 1D 51
0D31:20 4B 0E D0 01 60 A2 01 CC
0D39:A0 03 20 E8 0A AD AC 1D 74
0D41:F0 2A 49 FF 38 69 0F 18 25
0D49:69 03 A8 A2 01 18 20 F0 B1
0D51:FF 20 FF 0C A0 00 B9 00 AC
0D59:02 C8 CC AC 1D B0 05 20 E0
0D61:D2 FF 90 F2 20 07 0D 20 7D
0D69:D2 FF 18 60 A0 11 A2 01 85
0D71:18 20 F0 FF 20 07 0D A9 9E
0D79:30 4C D2 FF 48 8A 48 98 AE
0D81:48 20 AC 0D F0 1F C9 F0 B6
0D89:D0 16 20 AC 0D F0 16 85 3E
0D91:B7 20 AC 0D F0 0F 20 D2 CC
0D99:FF C8 C4 B7 D0 F8 F0 E1 28
0DA1:20 D2 FF 90 DC 68 A8 68 CB
0DA9:AA 68 60 BA FE 06 01 D0 CD
0DB1:03 FE 07 01 BD 06 01 85 8B
0DB9:BB BD 07 01 85 BC A0 00 72
0DC1:B1 BB 60 A9 B5 85 FB A9 AE
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0DC9:1A 85 FC 60 20 27 0E 20 D1
0DD1:4B 0E D0 01 60 A9 01 8D 78
0DD9:B7 1D A9 16 8D B8 1D AD E4
0DE1:AA 1A 85 FB AD AB 1A 85 1E
0DE9:FC AD B8 1D 38 E9 03 A8 EE
0DF1:AE B7 1D 18 20 F0 FF 20 5B
0DF9:07 0D AD AC 1A F0 03 09 FE
0E01:30 2C A9 20 20 D2 FF AD 71
0E09:B7 1D 38 E9 01 09 30 20 9A
0E11:D2 FF 20 FF 0C 20 5A 0E 3E
0E19:20 93 0E EE B7 1D AD B7 20
0E21:1D C9 0B 90 C4 60 20 4B DB
0E29:0E D0 01 60 A9 01 8D B7 CA
0E31:1D A9 03 8D B8 1D 20 C4 BE
0E39:0D 20 5A 0E 20 93 0E EE 6A
0E41:B7 1D AD B7 1D C9 0B 90 68
0E49:F0 60 AD C2 1D 0D D7 1D C1
0E51:D0 03 69 01 60 AD AD 1A 03
0E59:60 AE B7 1D AC B8 1D 20 BC
0E61:E8 0A 20 A7 0E 20 DD BD 5D
0E69:A0 00 B9 00 01 F0 03 C8 A7
0E71:D0 F8 98 49 FF 38 69 0F 9E
0E79:18 6D B8 1D A8 AE B7 1D 72
0E81:18 20 F0 FF A0 00 B9 00 48
0E89:01 F0 06 20 D2 FF C8 D0 1E
0E91:F5 60 A5 FB 18 69 05 85 2B
0E99:FB 90 F6 E6 FC 60 A2 B5 89
0EA1:A0 1A 86 FB 84 FC A0 00 7E
0EA9:B1 FB 85 61 84 70 C8 B1 8D
0EB1:FB 85 66 09 80 85 62 C8 32
0EB9:A2 00 B1 FB 95 63 E8 C8 F1
0EC1:C0 05 90 F6 A5 66 45 6E C0
0EC9:85 6F A5 61 60 A2 B5 A0 E8
0ED1:1A 86 FB 84 FC A0 00 B1 80
0ED9:FB 85 69 C8 B1 FB 85 6E 06
0EE1:45 66 85 6F B1 FB 09 80 F1
0EE9:85 6A C8 A2 00 B1 FB 95 FA
0EF1:6B E8 C8 C0 05 90 F6 A5 21
0EF9:61 60 86 FB 84 FC 20 1B E2
0F01:BC A0 00 A5 61 91 FB 84 CD
0F09:70 C8 A5 66 09 7F 25 62 9F
0F11:91 FB C8 A2 00 B5 63 91 69
0F19:FB E8 C8 C0 05 90 F6 60 4D
0F21:A9 00 85 22 A9 02 85 23 6A
0F29:AD AC 1D 20 B5 B7 A2 B5 76
0F31:A0 1A 4C FB 0E 2C AB 1D 05
0F39:30 01 60 A9 00 8D AB 1D 01
0F41:8D AA 1D AC AC 1D F0 09 04
0F49:20 21 0F A9 00 8D AC 1D E8
0F51:60 4C 7A 0F A0 F5 B9 B4 F7
0F59:1A 99 B9 1A 88 D0 F7 60 9B
0F61:A0 00 B9 BA 1A 99 B5 1A 6F
0F69:C8 C0 F5 90 F5 A0 00 98 AE
0F71:99 AA 1B C8 C0 05 90 F8 2B
0F79:60 A0 04 A9 00 99 B5 1A F6
0F81:88 10 FA 60 20 C3 CC C5 BC
0F89:C1 D2 3F 00 20 C3 CC C5 94
0F91:C1 D2 20 C1 CC CC 3F 00 7D
0F99:A2 80 2C A2 40 2C A2 00 D0
0FA1:8E A7 1A 2C A7 1A 30 05 02
0FA9:70 06 A9 0F 2C A9 0D 2C F5
0FB1:A9 11 48 20 07 0D A2 0D B2
0FB9:86 22 A0 03 A6 22 18 20 F5
0FC1:F0 FF 20 B7 0A E6 22 E6 EE
0FC9:22 A5 22 C9 14 90 EB 68 66
0FD1:AA 20 DD 0F 2C C5 1D 30 DC
0FD9:01 60 A2 13 A0 03 18 20 77
0FE1:F0 FF A9 BA 4C D2 FF 20 27
0FE9:1C 10 20 55 0F A0 04 B1 28
0FF1:FB 99 B5 1A 88 10 F8 60 A3
0FF9:20 1C 10 A0 04 B9 B5 1A C7
1001:91 FB 88 10 F8 60 20 5E E2
1009:10 20 55 0F A0 00 BD BA 10
1011:1A 99 B5 1A E8 C8 C0 05 ED
1019:90 F4 60 20 36 10 20 44 43
1021:10 A9 B6 A0 1B 18 65 FB 94
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1029:85 FB 98 65 FC 85 FC 60 CC
1031:A2 12 4C 14 08 20 9F 0E FF
1039:20 F7 B7 20 61 0F A5 15 08
1041:D0 EE 60 A5 14 C9 64 B0 2D
1049:E7 A0 00 84 FC 0A 26 FC 27
1051:0A 26 FC 18 65 14 85 FB A3
1059:90 02 E6 FC 60 20 1C 10 BA
1061:A5 14 F0 CC C9 32 B0 C8 85
1069:C6 14 20 44 10 A6 FB 8A D7
1071:60 20 5E 10 48 A0 00 BD 19
1079:B5 1A 99 AD 1D C8 E8 C0 A7
1081:05 90 F4 68 A8 20 63 0F 09
1089:20 55 0F A2 00 BD AD 1D 8A
1091:9D B5 1A E8 E0 05 90 F5 F1
1099:60 A9 05 AA D0 D6 AD AA 87
10A1:1A 18 69 32 8D AA 1A AD 1E
10A9:AB 1A 69 00 8D AB 1A EE 91
10B1:AC 1A AD AC 1A C9 0A 90 CB
10B9:0F A9 B6 8D AA 1A A9 1B A7
10C1:8D AB 1A A9 00 8D AC 1A 1B
10C9:60 AD AA 1A 38 E9 32 8D D7
10D1:AA 1A AD AB 1A E9 00 8D 44
10D9:AB 1A CE AC 1A 10 0F A9 D3
10E1:78 8D AA 1A A9 1D 8D AB 21
10E9:1A A9 09 8D AC 1A 60 A2 AC
10F1:AA A9 15 20 A0 19 F0 01 C2
10F9:60 6C FC FF A2 85 A9 0F 92
1101:20 A0 19 F0 01 60 A9 B5 20
1109:85 FB A9 1A 85 FC A0 00 25
1111:98 91 FB E6 FB D0 02 E6 DF
1119:FC A5 FB C9 AD A5 FC E9 27
1121:1D 90 ED 60 A2 8D A9 0F 67
1129:20 A0 19 F0 01 60 20 07 86
1131:11 A9 00 8D 00 B0 8D 01 FD
1139:B0 8D 00 A0 8D 01 A0 A9 7C
1141:00 8D A5 1A A9 A0 8D A6 AE
1149:1A A9 00 8D A3 1A A9 B0 45
1151:8D A4 1A 60 20 36 10 A5 4C
1159:14 8D AD 1A 60 20 70 0A AE
1161:A9 93 20 D2 FF A2 80 6C 66
1169:00 03 AC 99 0F B2 9F 0F 0D
1171:A5 9C 0F 51 F0 10 44 DA AF
1179:15 94 FD 10 93 25 11 49 A8
1181:07 10 4F 72 10 57 9A 10 5F
1189:46 E8 0F 50 F9 0F 91 9F BE
1191:10 11 CA 10 CD 4A 13 4D 65
1199:28 13 52 B9 13 53 24 15 BD
11A1:4C 0E 15 5A 55 11 B6 4A 5C
11A9:16 B0 B5 16 AE 95 17 42 57
11B1:45 18 43 3B 18 58 5E 11 88
11B9:BF CD 15 A7 C7 15 00 20 FE
11C1:79 12 20 CC BC 20 80 12 6F
11C9:4C 53 B8 20 0C BC 20 C5 59
11D1:0E 4C 2B BA 20 DB 11 4C FD
11D9:12 BB A2 7B A0 1A 4C D2 D8
11E1:0E 20 22 12 4C 6B E2 20 6E
11E9:22 12 4C 64 E2 20 22 12 5F
11F1:4C B4 E2 20 36 12 20 B4 B4
11F9:BF A2 80 A0 1A 20 D2 0E C3
1201:20 6A B8 4C 0A 12 20 36 BA
1209:12 2C A7 1A 30 09 70 01 5F
1211:60 A2 8A A0 1A D0 04 A2 28
1219:85 A0 1A 20 D2 0E 4C 2B FF
1221:BA 2C A7 1A 30 09 70 01 CB
1229:60 A2 94 A0 1A D0 EC A2 53
1231:8F A0 1A D0 E6 20 CC 11 F7
1239:20 B4 BF 20 DB 11 20 6A 62
1241:B8 20 71 BF A5 61 F0 09 91
1249:20 CE 0E 20 12 BB 4C 0E 1B
1251:E3 A2 80 A0 1A 20 A3 0E D0
1259:AD B6 1A 85 66 60 20 0E A0
1261:E3 4C 0A 12 20 EA B9 A2 AF
1269:99 A0 1A 4C 1C 12 A2 9E 97
1271:A0 1A 20 1C 12 4C ED BF 8F
1279:A2 AD A0 1D 4C FB 0E A2 51
1281:AD A0 1D 4C D2 0E C9 CC 3C
```

```
1289:BC C6 C0 11 D6 D5 11 5F 76
1291:B4 BF C1 58 BC CE EA B9 6E
1299:D8 ED BF C4 65 12 C5 6F 58
12A1:12 D1 CC 11 D4 71 BF 09 E2
12A9:E2 11 0F E8 11 01 EE 11 6F
12B1:13 07 12 03 F4 11 07 5F EC
12B9:12 00 20 12 BB 20 C0 11 FC
12C1:20 C4 0D 20 D6 0E 4C 2B 7D
12C9:BA 20 D5 11 A2 BA A0 1A 7A
12D1:20 D2 0E 4C 7B BF 2B 6A DC
12D9:B8 2D 53 B8 2A 2B BA 2F 3E
12E1:12 BB D3 BB 12 5E 7B BF F4
12E9:D2 CA 12 00 20 D3 C1 D6 17
12F1:C5 20 CD C1 C3 D2 CF D3 B3
12F9:3F 00 20 CC CF C1 C4 20 BD
1301:CD C1 C3 D2 CF D3 3F 00 70
1309:20 C5 D8 C5 C3 D5 D4 C5 0D
1311:20 CD C1 C3 D2 CF 3F 00 83
1319:20 D2 C5 C3 CF D2 C4 20 6C
1321:CD C1 C3 D2 CF 3F 00 A2 62
1329:09 A9 13 20 67 19 20 FB 7E
1331:14 8D 01 02 A9 01 8D 00 71
1339:02 20 C1 19 B0 2C 20 FB A4
1341:14 8D 02 02 EE 00 02 D0 81
1349:0A A2 09 A9 13 20 FF 18 0A
1351:D0 01 60 20 C1 19 B0 12 14
1359:20 5E 08 20 7D 0D 4E 4F 36
1361:20 4D 41 43 52 4F 00 4C 63
1369:44 08 AD C2 1D F0 31 98 3D
1371:48 A2 00 AC D7 1D C0 1E 02
1379:90 15 20 5E 08 20 7D 0D DF
1381:4D 41 43 52 4F 20 53 54 22
1389:41 43 4B 00 4C 44 08 BD CB
1391:C0 1D 99 D8 1D E8 C8 E0 1F
1399:03 90 F4 8C D7 1D 68 A8 79
13A1:C8 98 38 65 F9 8D C0 1D 54
13A9:A5 FA 69 00 8D C1 1D 20 5C
13B1:B8 14 8C C2 1D 4C D7 0A CA
13B9:2C C5 1D 10 4B A0 10 B9 C2
13C1:C6 1D 99 00 02 88 10 F7 10
13C9:AD A5 1A 85 FB AD A6 1A C9
13D1:85 FC 20 54 1A A9 00 8D 48
13D9:C5 1D 20 A4 0F AE C3 1D 50
13E1:86 22 AC C4 1D 84 23 E8 DF
13E9:D0 01 C8 8E A5 1A 8C A6 10
13F1:1A 8A 38 E5 FB 48 98 E5 45
13F9:FC AA A9 00 A8 91 22 C8 17
1401:91 22 C8 91 22 4C A8 16 56
1409:A2 19 A9 13 20 FF 18 D0 31
1411:04 8D C6 1D 60 A0 10 B9 A8
1419:00 02 99 C6 1D 88 10 F7 84
1421:20 C1 19 90 10 A9 00 85 A2
1429:AE A9 B0 85 AF 20 F1 19 7C
1431:A2 02 20 68 1A AD C6 1D E7
1439:18 69 03 6D A5 1A 8D C3 73
1441:1D AD A6 1A 69 00 8D C4 05
1449:1D A2 FF 8E C5 1D 4C A4 71
1451:0F AD C2 1D D0 07 20 D2 4C
1459:14 F0 14 30 F4 20 B8 14 FA
1461:8D C2 1D 98 EE C0 1D D0 B3
1469:4B EE C1 1D 4C B5 14 A5 04
1471:C6 F0 41 20 E4 FF 2C C5 A8
1479:1D 10 39 48 EE C3 1D D0 71
1481:03 EE C4 1D AD C3 1D 85 8D
1489:24 C9 FD AD C4 1D 85 25 9B
1491:C9 AF 68 90 1B 20 5E 08 BE
1499:20 7D 0D 4D 41 43 52 4F B2
14A1:20 42 55 46 46 45 52 20 85
14A9:46 55 4C 4C 00 4C 44 08 5A
14B1:A0 00 91 24 29 FF 60 20 C8
14B9:4B 15 AD C0 1D 85 24 AD 83
14C1:C1 1D 85 25 A0 01 B1 24 A5
14C9:48 88 B1 24 A8 68 4C 53 83
14D1:15 AC D7 1D F0 0F A2 02 87
14D9:B9 D7 1D 9D C0 1D 88 CA A8
14E1:10 F6 8C D7 1D 60 48 A9 83
```

```
14E9:00 8D C5 1D 8D C2 1D 8D 3F
14F1:D7 1D 68 60 20 52 14 F0 C3
14F9:FB 60 20 F5 14 20 EF 0C A8
1501:B0 F8 4C D2 FF 20 E4 FF C2
1509:C9 00 F0 F9 60 A0 09 A2 10
1511:ED A9 12 20 E6 16 D0 01 13
1519:60 20 CC FF A2 00 A0 A0 0C
1521:4C 4D 17 A2 ED A9 12 20 2C
1529:FF 18 D0 01 60 A9 00 85 B2
1531:F9 A9 A0 85 FA 20 2C 1A F9
1539:D0 01 60 AD A5 1A 85 AE 42
1541:AD A6 1A 85 AF A0 09 4C E5
1549:B4 17 48 A9 30 78 85 01 A6
1551:68 60 48 A9 37 85 01 58 95
1559:68 60 20 CC CF C1 C4 20 CF
1561:D0 D2 C7 3A 20 CE C1 CD D2
1569:C5 3F 00 20 CC CF C1 C4 36
1571:20 C1 CC CC 3A 20 CE C1 34
1579:CD C5 3F 00 20 D3 C1 D6 8E
1581:C5 20 C1 CC CC 3A 20 CE F9
1589:C1 CD C5 3F 00 20 C5 D8 99
1591:C5 C3 D5 D4 C5 3F 00 20 E2
1599:C3 CC C5 C1 D2 20 26 20 31
15A1:C5 D8 C5 C3 D5 D4 C5 3F A6
15A9:00 20 D1 D5 C9 D4 3F 00 93
15B1:41 4C 4C 2E 46 49 4C 45 31
15B9:00 4D 41 43 2E 46 49 4C FC
15C1:45 00 2C 50 2C 57 A2 00 1D
15C9:A0 A0 D0 04 A2 00 A0 B0 CD
15D1:86 F9 84 FA 20 2C 1A D0 B4
15D9:0F 20 1A 0B 20 A4 0F 20 59
15E1:D6 0D 20 2D 0E 4C D7 0A EC
15E9:A2 01 A9 14 D0 02 A6 D6 CE
15F1:48 A0 01 18 20 F0 FF 20 EE
15F9:DA 0A A9 0D 20 D2 FF 68 CE
1601:38 E9 01 D0 E9 A2 01 A0 6D
1609:0C 18 20 F0 FF 20 2C 1A 47
1611:D0 06 20 BC 0A 4C DA 15 43
1619:A6 D6 A0 0C 18 20 F0 FF 46
1621:A0 02 20 38 1A 85 FB A2 27
1629:00 C8 20 38 1A 20 D2 FF 06
1631:E8 E4 FB 90 F4 A9 0D 20 1C
1639:D2 FF 20 40 1A A5 D6 C9 B5
1641:14 90 CA 20 BC 0A 4C D5 73
1649:15 A2 5B A9 15 20 FF 18 EF
1651:D0 01 60 A9 00 85 F9 A9 80
1659:B0 85 FA 20 C9 19 90 12 86
1661:AD A3 1A 85 AE AD A4 1A 78
1669:85 AF 20 F1 19 A2 00 20 DA
1671:68 1A 20 1F 17 20 8C 19 B9
1679:20 54 1A A9 00 20 24 1A 8B
1681:98 38 65 FB AA A5 FC 69 C3
1689:00 A8 20 43 17 A5 FB 38 97
1691:ED A3 1A 48 A5 FC ED A4 07
1699:1A AA 20 8C 19 A5 F9 8D 2B
16A1:A3 1A A5 FA 8D A4 1A A0 5E
16A9:00 68 20 24 1A 8A C8 20 E2
16B1:24 1A 38 60 A0 00 A2 6C 3A
16B9:A9 15 20 E6 16 D0 01 60 C8
16C1:20 19 17 85 22 20 19 17 5A
16C9:85 23 20 CC FF AD A3 1A 6A
16D1:18 69 02 AA AC A4 1A 90 0C
16D9:01 C8 20 43 17 A5 22 48 CC
16E1:A6 23 4C 9B 16 84 22 A2 17
16E9:6C A9 15 20 FF 18 D0 01 5E
16F1:60 20 1F 17 A2 01 20 C6 CB
16F9:FF B0 28 A4 22 20 19 17 7C
1701:D9 B1 15 F0 04 A9 18 D0 02
1709:1A C8 B9 B1 15 D0 EE A9 3C
1711:FF 60 20 D2 FF B0 0C 60 C3
1719:20 E4 FF B0 06 60 20 C0 4E
1721:FF 90 07 20 30 18 AA 4C D9
1729:14 08 A2 01 20 C6 FF B0 94
1731:F2 20 19 17 20 19 17 24 2D
1739:90 50 04 A9 04 D0 E4 4C 58
1741:CC FF A9 00 85 AE A9 FF 45
1749:85 AF D0 08 A9 00 85 AE C7
1751:A9 B0 85 AF 86 FB 84 FC 56
1759:A2 01 20 C6 FF B0 C4 20 F5
1761:19 17 A0 00 20 24 1A E6 A2
1769:FB D0 02 E6 FC 24 90 70 82
1771:0E A5 FB C5 AE A5 FC E5 D7
1779:AF 90 E4 A9 10 D0 A4 20 08
1781:30 18 A5 FB 85 F9 A5 FC 9E
1789:85 FA A0 00 98 20 24 1A F4
1791:C8 4C 24 1A A2 7D A9 15 D0
1799:20 FF 18 D0 01 60 20 97 49
17A1:19 20 2C 1A D0 01 60 AD 84
17A9:A3 1A 85 AE AD A4 1A 85 85
17B1:AF A0 00 84 22 A2 00 AC 70
17B9:00 02 BD C3 15 99 01 02 6F
17C1:C8 E8 E0 04 90 F4 8C 00 5C
17C9:02 20 59 19 20 C0 FF 90 52
17D1:03 4C 24 17 A2 01 20 C9 AD
17D9:FF B0 F6 A9 20 20 13 17 6C
17E1:20 13 17 A5 90 F0 23 20 D0
17E9:30 18 20 12 0B 20 7D 0D 3C
17F1:92 D0 D2 C5 D3 D3 20 C6 49
17F9:31 3A 20 46 49 4C 45 20 DD
1801:45 58 49 53 54 53 00 4C 84
1809:44 08 A4 22 B9 B1 15 F0 C3
1811:06 20 13 17 C8 D0 F5 A0 36
1819:00 20 38 1A 20 13 17 E6 5C
1821:F9 D0 02 E6 FA A5 F9 C5 59
1829:AE A5 FA E5 AF 90 E8 48 B1
1831:20 CC FF A9 01 20 C3 FF 4F
1839:68 60 A2 98 A9 15 20 FF 75
1841:18 D0 0B 60 A2 8E A9 15 D0
1849:20 FF 18 D0 04 60 A9 FF 8E
1851:2C A9 00 8D A9 1A 20 97 68
1859:19 20 C9 19 B0 05 A2 04 CB
1861:4C 14 08 C8 84 FB 20 AE 4D
1869:19 A0 00 20 38 1A 38 E5 D0
1871:FB 85 22 C8 20 38 1A E9 D1
1879:00 85 23 A5 2B 18 65 22 70
1881:85 2D A5 2C 65 23 85 2E 28
1889:A5 FB 18 65 F9 85 F9 A5 64
1891:FA 69 00 85 FA 20 C6 08 DF
1899:20 59 A6 20 33 A5 A9 00 8A
18A1:20 90 FF A0 00 B9 F1 18 F2
18A9:99 AE 1A B9 F8 18 99 AF 3C
18B1:1B C8 C0 07 90 EF A5 2F E8
18B9:85 F7 A5 30 85 F8 A9 FC C2
18C1:85 22 A9 02 85 23 A9 AE 4D
18C9:85 F9 A9 1A 85 FA 20 C6 31
18D1:08 A9 FC 18 65 2F 85 31 B5
18D9:A9 02 65 30 85 32 A9 FF 57
18E1:8D A8 1A 2C A9 1A 10 05 E3
18E9:A9 93 20 D2 FF 4C AE A7 3B
18F1:43 53 01 01 01 00 32 43 78
18F9:4D FB 01 01 00 64 20 67 39
1901:19 AE B7 1D AC B8 1D 18 CE
1909:20 F0 FF A0 00 CC 00 02 C6
1911:B0 09 B9 01 02 20 D2 FF 5B
1919:C8 D0 F2 20 7D 0D 12 20 A8
1921:92 20 00 20 F5 14 C9 0D 47
1929:F0 22 C9 14 D0 0A AD 00 E0
1931:02 F0 CE CE 00 02 B0 C9 9A
1939:20 EF 0C B0 C4 AC 00 02 DE
1941:C0 10 B0 BD EE 00 02 99 DE
1949:01 02 90 B5 20 D7 0A A9 08
1951:01 A0 02 A2 08 20 BA FF CC
1959:AD 00 02 A2 01 A0 02 20 7B
1961:BD FF AD 00 02 60 86 F9 C0
1969:85 FA 20 FF 0C 20 12 0B 31
1971:A0 00 8C 00 02 B1 F9 F0 41
1979:06 20 D2 FF C8 D0 F6 38 C0
1981:20 F0 FF 8E B7 1D C8 8C 39
1989:B8 1D 60 AD A3 1A 85 FB D2
1991:AD A4 1A 85 FC 60 A9 00 1C
1999:85 F9 A9 B0 85 FA 60 20 46
19A1:FF 18 F0 06 AD 01 02 C9 97
19A9:59 60 A9 4E 60 A9 F6 85 D7
19B1:2B 85 F7 85 7A A9 1D 85 6C
19B9:2C 85 F8 85 7B E6 2B 60 09
19C1:A9 00 85 F9 A9 A0 85 FA EE
19C9:20 2C 1A D0 02 18 60 C8 61
19D1:20 38 1A CD 00 02 D0 12 FD
19D9:A2 00 C8 20 38 1A DD 01 5F
19E1:02 D0 07 E8 EC 00 02 90 B4
19E9:F1 60 20 40 1A 4C C9 19 E3
19F1:A5 F9 85 F7 A5 FA 85 F8 C2
19F9:A0 00 20 38 1A 48 18 65 8B
1A01:F7 AA C8 20 38 1A 48 18 C9
1A09:65 F8 85 FA 86 F9 A5 AE A4
1A11:38 E5 F9 85 22 A5 AF E5 5F
1A19:FA 85 23 20 C6 08 68 A8 62
1A21:68 38 60 20 4B 15 91 FB 73
1A29:4C 53 15 A0 00 20 38 1A 10
1A31:F0 04 08 C8 28 60 C8 20 E0
1A39:4B 15 B1 F9 4C 53 15 A0 A8
1A41:00 20 38 1A 18 65 F9 AA 1B
1A49:C8 20 38 1A 65 FA 85 FA AF
1A51:86 F9 60 A0 02 A2 00 BD B5
1A59:00 02 20 24 1A C8 EC 00 22
1A61:02 B0 03 E8 D0 F1 60 49 0A
1A69:FF 38 7D A3 1A 9D A3 1A 3E
1A71:98 49 FF 7D A4 1A 9D A4 89
1A79:1A 60 81 00 00 00 00 81 84
1A81:49 0F DA A1 86 65 2E E0 9A
1A89:D4 86 7E A5 DD 5E 7B 0E 61
1A91:FA 35 12 7B 00 AD FC 90 CB
1A99:7F 5E 5B D8 AA 82 13 5D 01
1AA1:8D DE 00 B0 00 A0 80 00 E2
1AA9:00 B6 1B 00 80 00 00 00 F2
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⊡

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PROGRAMS

COILCALC

USE YOUR 64 TO DESIGN COILS FOR ELECTRONIC CIRCUITS

ROBERT MARCUS

Designing air-core coils for shortwave radios or other electronic circuits requires complicated formulas and trial-and-error adjustments. *CoilCalc* is a computer-aided design program that should be an invaluable aid to ham radio operators or other electronic hobbyists.

Coils are important components of tuning circuits found in radio transmitters and receivers. When designing an air-core coil for a tuned circuit, the inductance of such a single layer coil is dependent on three variables: coil diameter, coil length, and the number of turns of wire in the coil. As a condition of the number of turns, wire size is a related factor.

Change any of these variables, and you change the inductance of the coil. Inductance is measured in units called *henries.*

Using a computer to do the number-crunching can make the selection of an inductor much easier. *CoilCalc* is a program that will calculate the inductance of a coil from its parameters; or if the inductance is known and you're winding your own coils, it will calculate coil length, coil diameter, and number of turns (wire size).

Getting Started

CoilCalc is written entirely in BASIC. To help prevent typing errors, use *The Automatic Proofreader* to type it in; see "Typing Aids" elsewhere in this section. When you've finished typing, be sure to save a copy of the program.

How to Use the Program

If you have a coil whose inductance is not known or if you need to know the inductance of a tuned circuit, select the inductance-unknown option after you've run *CoilCalc.* The calculation of the coil parameters is done initially with the wire size as specified. This is done on the basis that the coils will be closely wound with the maximum number of turns used for the length considered.

A custom calculation can be selected where the number of turns is used to obtain a more accurate result. Also, the dimensions may be tailored more exactly to fractional ones, with the resulting change to the inductance given as a percentage. When the wire size becomes larger than 10 percent of the coil diameter, it's best to use the custom option. In this mode the wire's diameter is included with the coil diameter for increased accuracy.

Keep in mind, however, that the result is approximately the true value; the actual value will be affected by the effects of the distributed capacitance. *CoilCalc's* calculations are based on the use of enameled wire. Should you wish to change to a different type of wire, the data statements giving the number of turns per linear inch for enameled wire, 8 gauge through 40 gauge, can be changed to suit.

An Example

Let's try an example. Suppose you wish to find the inductance of a coil having 8 turns of #12 enamel wire wound over 1 inch, with a inside diameter of 0.5 inch.

The menus will direct you to the inductance of a coil where you'll be asked to enter the wire gauge, coil diameter, and coil length. Supply the above figures. *CoilCalc* will then display the inductance as 0.69 microhenries. This is based on a closely wound coil, having the maximum of 12 turns of #12 wire over the one inch. Additional variables, however, may affect the accuracy of this calculation.

Need More Accuracy?

Assume the coil in question, however, is loosely wound and that the wire diameter is larger than 10 percent of the coil's diameter. In this case we should select the custom option by hitting the Ctrl key. This option now asks for the number of turns, which would be entered as 8, followed by the coil diameter and length as before. The new inductance value will be displayed as 0.4 microhenries, a more accurate value for this particular coil. The percent of change is also given, but in this case we aren't concerned with the resulting change.

Select the custom option again, but this time enter 12 turns with the same diameter and length as before. *CoilCalc* now indicates an inductance of 0.9 microhenries; this value compared to the original of 0.69 is the result of increased accuracy, as the wire diameter is included in the calculations. This shows that when dealing with small coils and large wire sizes, the custom design option should be consulted.

Run the program again. This time select the known-inductance option and assume you want a coil whose inductance is 25 microhenries. Suppose we plan to use #22 wire on a form having a diameter of 1.5 inches. How long will the coil have to be? Again *CoilCalc* will ask for the wire size and coil diameter, but because the inductance is known, it will calculate the length for you.

If you provide the length, the program will determine what diameter the coil should have. If you provide any two parameters, *CoilCalc* calculates the third. On completion of the calculation, an approximate figure of 0.65 inch using 24 turns would be indicated. This also gives a tolerance of 3.3 percent, indicating the inductance is 3.3 percent higher than requested.

Now select the custom option so you may tailor the parameters to more convenient fractional sizes. Entering different values of turns and length will allow you to obtain a length or a number of fractional turns that's best suited to you. You'll find, for example, 25 turns and a length of 0.75 inch give a value of 25.8 microhenries, or 3.2-percent higher; 27 turns and a length of 1 inch give 25.11 microhenries, or 4-percent higher. If you enter a value of turns for a given length that exceeds turns/inch of the wire gauge selected, you're told that the gauge has changed.

CoilCalc limits the calculation of lengths up to 4 inches and not less than 0.05 inch. You should make a change in wire size or coil diameter when this limit is reached.

COILCALC

```
KH 0 REM COPYRIGHT 1991 COMPUT
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HD 100 REM * * INITIALIZE * *
       {SPACE}*
EM 110 HD$="{RVS}INDUCTOR
       {3 SPACES}DESIGN{OFF}"
QF 120 DIMTN(40):FORI=8TO40:RE
       ADTN(I):NEXT
RR 130 DEFFNPU(X)=3*VAL(CD$)*I
       N+9*IN*(X):DEFFNNN(X)=T
       N(GA)↑2*.2*VAL(CD$)↑2*X
       ↑2
CE 140 POKE53280,0:POKE53281,0
       :POKE646,7
JH 150 REM * * MENU PAGE * * *
GG 160 PRINT"{CLR}{4 RIGHT}"HD
       $
BE 170 PRINT"{DOWN}{RIGHT}PARA
       METERS FOR A SINGLE-LAY
       ER,":
FM 180 PRINT"{RIGHT}AIR-CORE I
       NDUCTOR USING ENAMEL WI
       RE."
HP 190 PRINT"{2 DOWN}{RIGHT}SE
       LECT: 1- INDUCTANCE UNK
       NOWN";
BJ 195 PRINT SPC(59)"2-
       {6 SPACES}"CHR$(34)"
       {5 SPACES}KNOWN"
RQ 200 INPUT"{3 DOWN}{RIGHT}CH
       OICE:{2 SPACES}1
       {3 LEFT}";A$
MB 210 IFA$<>"1"ANDA$<>"2"THEN
       200
BM 220 IFA$="1"THEN260
KS 230 PRINT"{DOWN}{RIGHT}ENTE
       R THE VALUE OF INDUCTAN
       CE"
EH 240 INPUT"{12 RIGHT}(IN MIC
       ROHENRIES)";IN$
KG 250 GOTO390
MQ 260 REM * * CALCULATE INDUC
       TANCE REQUIRED*
BB 270 PRINT"{CLR}{5 RIGHT}"HD
       $
JA 280 PRINT"{DOWN}{RIGHT}DETE
       RMINE INDUCTANCE REQUIR
       ED:-"
QX 290 PRINT"{DOWN}{RIGHT}SELE
       CT 1-INDUCTANCE OF AN E
       XISTING COIL"
HF 300 PRINT"{8 RIGHT}2-INDUCT
       ANCE OF A TUNED INDUCTO
       R"
MK 310 INPUT"{DOWN}{RIGHT}CHOI
       CE{2 SPACES}1{3 LEFT}";
       B$:IFB$<>"1"ANDB$<>"2"T
       HEN310
QJ 320 IFB$="1"THEN400
GE 330 PRINT"{CLR}{5 RIGHT}"HD
       $
AP 340 INPUT"{DOWN}{2 RIGHT}EN
       TER FREQ. IN KHZ";FR$
HK 350 INPUT"{DOWN}{2 RIGHT}EN
       TER CAPACITANCE IN MMFD
       S";CA$
QP 360 IN$=STR$(INT(100*25330*
       10↑6/(VAL(CA$)*VAL(FR$)
       ↑2)+.5)/100)
MG 370 PRINT"{DOWN}{2 RIGHT}IN
       DUCTANCE REQUIRED IS:":
       PRINT"{DOWN}{7 RIGHT}"I
       N$" MICROHENRIES"
SM 380 GOSUB1310
EF 390 IN=VAL(IN$)
GD 400 REM * * CALCULATE INDUC
       TOR SIZE * *
JS 410 PRINT"{CLR}{6 RIGHT}"HD
       $:IFB$="2"ORA$="2"THEN4
       30
RJ 420 PRINT"{2 DOWN}{RIGHT}FO
       R AN EXISTING INDUCTOR
       {SPACE}ENTER ALL":PRINT
       "{RIGHT}PARAMETERS.":GO
       TO440
RC 430 PRINT"{2 DOWN}{RIGHT}TO
        DETERMINE AN INDUCTOR
       {SPACE}SIZE ENTER":PRIN
       T"{RIGHT}ANY TWO PARAME
       TERS.
EC 440 FL=0:CO=5:RO=6:GOSUB127
       0:PRINT"WIRE SIZE
       {3 SPACES}(AWG 8-40):"
CC 450 RO=8:GOSUB1270:PRINT"CO
       IL DIAMETER (INCHES):"
AX 460 RO=10:GOSUB1270:PRINT"C
       OIL LENGTH{3 SPACES}(IN
       CHES):"
PE 470 CO=30:RO=6:GOSUB1270:IN
       PUTGA$:GA=VAL(GA$):IFGA
       $=""THENFL=FL+1:GOTO490
FF 480 IFGA<8ORGA>40THENGOSUB1
       300:GOTO440
XF 490 RO=8:GOSUB1270:INPUTCD$
       :IFCD$=""THENFL=FL+1
HA 500 IFIN>0ANDFL=0THEN520
CF 510 RO=10:GOSUB1270:INPUTCL
       $:IFCL$=""THENFL=FL+1
FP 520 IFFLANDIN$=""THENGOSUB1
       280:GOTO440
DP 530 IFFL>1THENPRINT"{RVS}RE
       QUIRE TWO PARAMETERS!":
       GOTO440
AC 540 IFIN$=""THEN580
FM 550 IFGA$=""THEN650
PF 560 IFCD$=""THEN720
XS 570 IFCL$=""THEN820
PJ 580 IN=INT(100*.2*VAL(CD$)↑
       2*(TN(GA)*VAL(CL$))↑2
HQ 585 IN=IN/((3*VAL(CD$))+(9*
       VAL(CL$))+.5)
SX 590 IN=IN/100
QD 600 PRINT"{DOWN}AN INDUCTOR
        WITH THE ABOVE PARAMET
       ERS"
HJ 610 PRINT"{RIGHT}WILL HAVE
       {SPACE}AN INDUCTANCE OF
       :":PRINT"{DOWN}
       {6 RIGHT}"IN"MICROHENRI
       ES"
SM 620 PRINT"{DOWN}{2 RIGHT}WI
       TH CLOSE SPACING OF"TN(
       GA)*VAL(CL$)"TURNS."
PM 630 GOTO1040
PJ 640 REM * * CALCULATE AWG#
       {SPACE}* * *
CJ 650 N=INT(10*SQR((3*VAL(CD$
       )+9*VAL(CL$))*VAL(IN$)/
       (.2*VAL(CD$)↑2))+.5)/10
DH 660 FORI=8TO40:IFSGN(TN(I)<
       N/VAL(CL$))THENNEXT
HS 670 PRINT"{DOWN}{RIGHT}AN I
       NDUCTANCE OF"IN"MICROHE
       NRIES"
BM 680 PRINT"{RIGHT}WILL REQUI
       RE"N"TURNS."
AS 690 PRINT"{DOWN}AWG#"I"HAS"
       TN(I)"PER INCH, CLOSE S
       PACED"
SJ 700 PRINT"OR USE SMALLER AW
       G, LOOSELY SPACED."
MK 710 GA=I:GOTO1060
PE 720 REM * * CALCULATE DIAME
       TER * * *
AS 730 N1=TN(GA)*VAL(CL$)
PB 740 MF=N1↑2*.2/IN
CQ 750 CD=INT(100*(3+SQR(9+4*M
       F*9*VAL(CL$)))/(2*MF)+.
       5)/100:CD$=LEFT$(STR$(C
       D),5)
BB 760 PRINT"{DOWN}FOR AN INDU
       CTANCE OF "IN$" MICROHE
       NRIES"
AP 770 PRINT"AND THE ABOVE PAR
       AMETERS, THE DIAMETER"
GK 780 PRINT"REQUIRED IS:
       {DOWN}"CD$" INCHES."
CD 790 PRINT"{DOWN}{RIGHT}WITH
       "TN(GA)*VAL(CL$)"TURNS
       {SPACE}OVER "CL$" INCH.
       ":CL=VAL(CL$):GOSUB1240
FD 800 PRINT"{DOWN}{RIGHT}TOLE
       RANCE "INT(1000*(L/VAL(
       IN$)-1)+.5)/10"%"
CK 810 GOTO1060
DK 820 REM * * CALCULATE LENGT
       H * *
CE 830 RO=12:CO=10:GOSUB1270:P
       RINT"{RVS}DOING THE CAL
       CULATION!":CO=1:GOSUB12
       70
CJ 840 IFFNNN(1)>FNPU(1)THEN94
       0
MB 850 FORI=1TO4STEP.1
RD 860 IFSGN(FNNN(I)-FNPU(I))=
       -1THENDF=ABS(FNNN(I)-FN
       PU(I)):NEXT:GOTO980
ME 870 IFDF<ABS(FNNN(I)-FNPU(I
       ))THENI=I-.1
DQ 880 PRINT"FOR AN INDUCTANCE
        OF "IN$" MICROHENRIES"
KG 890 PRINT"{RIGHT}AND THE AB
       OVE PARAMETERS, COIL LE
       NGTH"
JD 900 PRINT"{RIGHT}REQUIRED I
       S:{DOWN}"I" INCHES,":N1
       =INT(10*TN(GA)*I+.5)/10
       :CD=VAL(CD$):CL=I
MM 910 GOSUB1240:PRINT"{DOWN}
       {8 RIGHT}WITH"N1"TURNS.
       "
JP 920 PRINT"{DOWN}{RIGHT}TOLE
       RANCE "INT(1000*(L/VAL(
         IN$)-1)+.5)/10"%"
AQ 930  PRINT"{DOWN}FOR BETTER
         {SPACE}ACCURACY TRY CUS
         TOM DESIGN":GOTO1060
GP 940  FORI=1TO.05STEP-.05
SX 950  IFSGN(FNNN(I)-FNPU(I))=
         1THENDF=FNNN(I)-FNPU(I)
         :NEXT:GOTO1010
AD 960  IFDF<ABS(FNNN(I)-FNPU(I
         ))THENI=I+.05
MC 970  I=INT(100*I+.5)/100:GOT
         O880
GK 980  PRINT"FOR THESE PARAMET
         ERS THE LENGTH IS":PRIN
         T" GREATER THAN 4 INCHE
         S. ";
HG 990  PRINT"TRY A LARGER":PRI
         NT" DIAMETER";
KQ 995  IFGA<40THENPRINT", AND/
         OR SMALLER GA."
DD 1000 GOSUB1310:GOTO400
AG 1010 PRINT"FOR THESE PARAME
          TERS THE LENGTH IS":PR
          INT" LESS THAN .05 INC
          HES. ";
BM 1020 PRINT"TRY A SMALLER":P
          RINT" DIAMETER";
XK 1025 IFGA>8THENPRINT", AND/
          OR LARGER GA."
MA 1030 GOSUB1310:GOTO400
HK 1040 REM * * CUSTOM * * *
JM 1050 PRINT"{DOWN}FOR LOOSE
          {SPACE}SPACING OF FEWE
          R TURNS SELECT":PRINT"
          CUSTOM!"
EJ 1060 PRINT"{DOWN}{RIGHT}
          {RVS}SHIFT{OFF} TO END
          . . . {RVS}CTRL{OFF} C
          USTOM DESIGN"
JF 1070 ONPEEK(653)GOTO1260,10
          70,1070,1090
SH 1080 GOTO1070
FS 1090 PRINT"{CLR}{RIGHT}
          {RVS}CUSTOM{3 SPACES}"
          HD$
BE 1100 PRINT"{DOWN}{RIGHT}AN
          {SPACE}INDUCTOR WITH:"
EP 1110 PRINT"{DOWN}{2 RIGHT}#
           OF TURNS OF AWG#"GA
SK 1120 PRINT"{DOWN}{2 RIGHT}C
          OIL DIAMETER OF ":PRIN
          T"{DOWN}{2 RIGHT}COIL
          {SPACE}LENGTH OF "
HB 1130 CO=25:RO=4:GOSUB1270:I
          NPUTN1:RO=RO+2:GOSUB12
          70:INPUTCD
HC 1140 RO=RO+2:GOSUB1270:INPU
          TCL
CF 1150 IFTN(GA+GC)*CL<N1THENG
          C=GC+1
AB 1160 IFTN(GA+GC-1)*CL=>N1TH
          ENGC=GC-1
BM 1170 IFN1>TN(GA)*CL+.0001TH
          ENPRINT"{DOWN}{RVS}MOR
          E TURNS/INCH!{OFF} - A
          WG# NOW"GA+GC
BX 1180 CD=CD+INT(100*1/TN(GA)
          +.5)/100:L=INT(100*.2*
          CD↑2*N1↑2/(3*CD+9*CL)+
          .5)/100
GG 1190 PRINT"{DOWN}{RIGHT}IND
          UCTANCE IS"L"UH"
HA 1200 PRINT"{DOWN}{RIGHT}CHA
          NGE :";
KQ 1210 PRINTINT(1000*(L/IN-1)
          +.5)/10"%"
RQ 1220 GOTO1060
EQ 1230 REM * CALCULATE L * *
          {SPACE}*
DC 1240 CD=CD+INT(100*1/TN(GA)
          +.5)/100:L=INT(100*.2*
          CD↑2*N1↑2/(3*CD+9*CL)+
          .5)/100
ES 1250 RETURN
HS 1260 END
CB 1270 POKE783,PEEK(783)AND25
          4:POKE782,CO:POKE781,R
          O:SYS65520:RETURN
SM 1280 PRINT"{RVS}WITH INDUCT
          ANCE UNKNOWN ALL PARAM
          ETERS{2 SPACES}":CO=16
          :RO=PEEK(214)
DK 1290 GOSUB1270:PRINT"{UP}
          {RVS}REQUIRED!":RETURN
MQ 1300 PRINT"{RVS}WIRE GAUGE
          {SPACE}IS OUTSIDE RANG
          E! ":RETURN
RP 1310 PRINT"{DOWN}{3 RIGHT}
          {RVS}SHIFT{OFF} TO CON
          TINUE!":WAIT653,1:RETU
          RN
CD 1320 REM * * DATA STATEMENT
          S * * *
DJ 1330 DATA7.6,8.6,9.6,10.7,1
          2,13.5,15,16.8
SQ 1340 DATA18.9,21.2,23.6,26.
          4,29.4,33.1,37,41.3
CM 1350 DATA46.3,51.7,58,64.9,
          72.7,81.6,90.5,101
GQ 1360 DATA113,127,143,158,17
          5,198,224,248,282     ⊡
```

GEOINFO EDITOR

USE THIS TIMESAVING UTILITY TO CHANGE NOTES IN GEOS DIALOG BOXES

HENNING VAHLENKAMP

When working with *GEOS*, have you ever wanted to change just a small note in a file's info dialog box? How about changing its write-protect status? Until now, making these changes required booting *GEOS* (a 30-second wait), closing the boot disk, opening your work disk, finding the file, and finally opening its dialog box. Having to do all this turns a simple task into a tedious chore.

Using *geoInfo Editor* eliminates this hassle by allowing you to work outside the *GEOS* environment. It takes you directly to your *GEOS* file's info. In addition to editing notes and changing the write-protect status, this utility offers additional features, such as the ability to change a file's class and the date a file was modified. Plus, you can dump this information to your printer.

What makes *geoInfo Editor* even more useful is that it works on both the 64 and the 128 (40 or 80 columns) and with 1541, 1571, and 1581 disk drives. When you run the program, system configuration is automatic.

Getting Started

The program is written entirely in BASIC. To prevent typing errors, use *The Automatic Proofreader* to type it in; see "Typing Aids" elsewhere in this section. When you've finished typing in the program, remember to save a copy of geoInfo Editor.

When you run *geoInfo Editor*, there will be a short pause before a window similar to *GEOS*'s info dialog box appears. To the left are information headings such as Filename, Disk, and so on. The space next to the headings is for file information. Below this window is a command line for entering information and displaying messages. The command line accepts most keyboard characters, including corrections made with the Del key.

The Menu Bar

The menu bar is next. It lists all the commands you can give the program. Insert a *GEOS* disk into your drive and press D to get a directory. As it is being displayed, you can press any key to make it pause; press any key again to make it continue. You also can press Q to quit the directory listing at any time.

The next menu item, C, lets you enter any valid disk command. Note that *geoInfo Editor* traps almost any error and identifies it with a message. Press Return to clear an error message and continue using the program.

Select R to read the information on a *GEOS* file. Just enter its name and press Return. Similarly, W writes, or saves, the information on the screen to the *GEOS* file. Before this command is executed, you're asked to confirm the save. Press Y to do it and any other key to abort the command. Press P to print the displayed information to any Commodore-compatible printer. Finally, Q quits the program and returns you to BASIC.

The Highlight Bar

After you've selected a file, you're ready to begin. Simply use the cursor keys to move the highlighted bar to the desired item and then press Return. File type, structure, and size cannot be changed. Doing so is unnecessary and could prevent the file from working correctly.

If you select Filename, Disk, Class, or Author, simply enter a new name. If you select Modified, enter the new date and time as MMDDYYHHMM (month, day, year, hour, minute). The new time must be in 24-hour format, where 1:00 p.m. is 13:00.

If you select Wrte Ptct (Write Protect), enter Y for *Yes* or N for *No.* If you select Memory, enter the new info as XXXXYYYYZZZZ (starting address, ending address, execution address of the file) in hexadecimal. Avoid this option unless you know what you're doing, since a wrong move here could cause a lot of trouble.

The final selection is Notes. Select it, and you'll be prompted for the number (1–4) of the line you wish to change. Next, enter new information on that line. Pressing Return with nothing on the command line deletes the selected line. The maximum number of characters that you can enter for all four lines combined is 95.

Wrapping It Up

All changeable items, except the actual four Notes lines, have an escape feature. In other words, if you select an item and decide not to make any changes, press Return without entering anything else on the command line. The previous information will remain. Furthermore, all selections have a maximum number of characters you can enter. So if you're typing and nothing else appears on the command line, you've reached the character limit.

One final note is in order. The *GEOS* character set doesn't correspond to the Commodore upper- and lowercase set. Therefore, uppercase *GEOS* characters result in lowercase Commodore characters and vice versa. Keep this in mind when you are typing in your changes.

GEOINFO EDITOR

```
XE 0 REM COPYRIGHT 1991 - COMP
     UTE PUBLICATIONS INTL LTD
      - ALL RIGHTS RESERVED
DB 5 REM BY HENNING VAHLENKAMP
RF 10 REM***SET-UP***
AB 20 IF PEEK(65534)=23 AND PE
      EK(215)=128 THEN40
AE 30 POKE53280,6:POKE53281,6:
      XX=3:TX=4:GOTO60
SG 40 POKE53265,11:POKE53296,1
      :SYS52684,3,26
DC 50 XX=23:XX$="{RIGHT}":TX=2
      4
SF 60 DN=8:T=18:OPEN1,DN,15
HE 70 PRINT#1,"M-R"CHR$(198)CH
      R$(229)CHR$(1)
BA 80 GET#1,BY$:IF ASC(BY$)=25
      5 THEN T=40:FL=1
SC 90 CLOSE1:DIM C$(16),T$(13)
      ,M$(15)
DH 100 FOR L=1 TO 32
QD 110 HB$=HB$+CHR$(192):S$=S$
       +" ":NEXT
MH 120 FOR L=. TO 10:READ CH$(
       L),LL(L):NEXT
ER 130 FOR L=. TO 16:READ C$(L
       ):NEXT
QF 140 FOR L=. TO 2:READ Q$(L)
       :NEXT
KQ 150 FOR L=1 TO 15:READ M$(L
       ):NEXT
JH 160 H$="-":Z$=CHR$(.):SS$=C
       HR$(160):HM$="{HOME}"
BE 170 RT$="{RIGHT}":DN$="
       {DOWN}":RS$="{RVS}"
MF 180 FOR L=1 TO XX:R$=R$+RT$
       :NEXT
PA 190 FOR L=1 TO 21:DM$=DM$+D
       N$:NEXT
KC 200 FOR L=. TO 5
AC 210 RT$=RT$+RT$+XX$:DN$=DN$
       +DN$:NEXT
DS 220 DN$=HM$+DN$:HX$="012345
       6789ABCDEF"
DP 230 REM***SCREEN***
BA 240 PRINTCHR$(14)"{CLR}
       {WHT}{DOWN}"R$"{A}"HB$"
       {S}"
SG 250 PRINTR$H$"**"H$"
       {3 SPACES}"M$(1)"
       {3 SPACES}"H$"**"H$
JF 260 PRINTR$"{Q}"HB$"{W}"
XK 270 FOR L=1 TO 10:PRINTR$H$
       S$H$:NEXT
CE 280 PRINTR$H$LEFT$(S$,9)LEF
       T$(HB$,23)"{W}"
CM 290 FOR L=1 TO 4
DQ 300 PRINTR$H$"{8}L"CHR$(L+4
       8)"{WHT}"H$LEFT$(S$,29)
       H$:NEXT
EM 310 PRINTR$"{Z}**{E}"LEFT$(
       HB$,29)"{X}"
QG 320 PRINTR$"*"HB$"*":PRINT:
       PRINTR$"*"HB$"*"
FX 330 PRINTR$"{8}"M$(2):PRINT
       R$M$(3);
AH 340 REM***MAIN***
KC 350 PRINTHM$LEFT$(DN$,5);
BD 360 FOR L=. TO 10
MK 370 PRINTLEFT$(RT$,TX)"{8}"
       CH$(L)"{WHT}":NEXT
SS 380 GOSUB1550
RJ 390 PRINTLEFT$(DN$,MC+5)LEF
       T$(RT$,TX)"{8}"RS$LEFT$
       (CH$(MC),LEN(CH$(MC))-1
       )"{WHT}"
SQ 400 GET K$:IF K$="" THEN400
DD 410 IF K$=CHR$(13) THEN530
BF 420 IF K$="D" THEN740
FJ 430 IF K$="C" THEN860
AD 440 IF K$="R" THEN920
XQ 450 IF K$="W" THEN1630
RA 460 IF K$="P" THEN1970
SQ 470 IF K$="Q" THEN2370
HQ 480 IF K$="{DOWN}" THEN MC=
       MC+1:IF MC>10 THEN MC=.
HF 490 IF K$="{UP}" THEN MC=MC
       -1:IF MC<. THEN MC=10
RD 500 PRINTLEFT$(DN$,M2+5)LEF
       T$(RT$,TX)"{8}"LEFT$(CH
       $(M2),LEN(CH$(M2))-1)"
       {WHT}"
KB 510 M2=MC:GOTO390
PP 520 REM***CHANGE***
QB 530 TM$=T$(MC):GOSUB2190
QR 540 IF T$(.)="" THEN PRINTM
       $(8):GOSUB2210:GOSUB220
       0:GOTO400
RS 550 IF MC<>2 AND MC<>4 AND
       {SPACE}MC<>5 THEN LN=LL
       (MC):GOSUB2060
ES 560 ON MC+1 GOTO570,570,580
       ,570,580,580,590,570,62
       0,650,680
QA 570 T$(MC)=TX$:GOTO710
AQ 580 PRINTM$(9):GOSUB2210:GO
       SUB2200:GOTO400
SA 590 MM=VAL(MID$(TX$,1,2)):D
       D=VAL(MID$(TX$,3,2)):YY
       =VAL(MID$(TX$,5,2))
BJ 600 HH=VAL(MID$(TX$,7,2)):N
       N=VAL(MID$(TX$,9,2))
XQ 610 FG=1:GOSUB1340:GOTO710
BH 620 IF TX$="Y" THEN T$(8)="
       YES":WP=WP OR 64
SC 630 IF TX$="N" THEN T$(8)="
       NO":WP=WP AND 191
JQ 640 GOTO710
RG 650 AD$=TX$:T$(9)="":Q=1:FO
       R L=. TO 2
AJ 660 T$(9)=T$(9)+Q$(L)+MID$(
       TX$,Q,4)
FK 670 Q=Q+4:NEXT:GOTO710
RG 680 X=VAL(TX$):IF X<1 OR X>
       4 THEN400
DH 690 LN=29:IF X=4 THEN LN=8
BJ 700 GOSUB2060:T$(9+X)=TX$:G
       OTO350
RS 710 IF TX$="" THEN T$(MC)=T
       M$:GOTO400
JA 720 GOTO350
AM 730 REM***DIRECTORY***
RS 740 PRINT"{CLR}":X=11:Y=12
EM 750 OPEN1,DN,.,"$0":GET#1,V
       1$
```

```
GH 760 GET#1,V1$,V1$,V1$,V1$,V
       2$,V3$
RP 770 PRINTASC(V1$+Z$)+ASC(V2
       $+Z$)*256V3$;
AC 780 FOR L=. TO X
PF 790 GET#1,V1$,V2$:PRINTV1$V
       2$;:NEXT
XX 800 GET K$:IF K$="Q" THEN83
       0
KS 810 IF K$<>"" THEN GOSUB221
       0
XJ 820 PRINT:IF V2$<>"" THEN X
       =Y:GOTO760
MX 830 CLOSE1
SQ 840 PRINT:PRINT M$(10):GOSU
       B2210:GOTO240
SF 850 REM***DISK COMMAND***
JX 860 LN=33:GOSUB2060:IF TX$=
       "" THEN900
EH 870 OPEN1,DN,15:PRINT#1,TX$
MF 880 INPUT#1,EN,EM$,ET,ES:GO
       SUB2190
CK 890 PRINTEN;EM$;ET;ES:GOSUB
       2210
FB 900 CLOSE1:GOSUB2200:GOTO40
       0
PC 910 REM***READ & DECODE***
DQ 920 FI$="":LN=16:S=1:IF FL
       {SPACE}THEN S=3
GG 930 GOSUB2060:IF TX$="" THE
       N400
GG 940 GOSUB2190:PRINTM$(6)
KR 950 OPEN1,DN,15,"I0":OPEN2,
       DN,2,"#"
MD 960 PRINT#1,"U1";2;.;T;S
CG 970 GET#2,TR$,SE$:TR$=TR$+Z
       $:SE$=SE$+Z$
AR 980 FOR VL=5 TO 244 STEP 32
ME 990 PRINT#1,"B-P";2;VL
KK 1000 FOR I=1 TO 16:GET#2,BY
        $
DK 1010 IF BY$=SS$ THEN1030
DX 1020 FI$=FI$+BY$:NEXT I
FD 1030 IF FI$=TX$ THEN1080
GG 1040 FI$="":NEXT VL
JK 1050 IF ASC(TR$)<>. THEN S=
        ASC(SE$):GOTO960
BP 1060 GOSUB2200:GOSUB2190:PR
        INTM$(5)
DP 1070 GOSUB2210:GOTO1530
SJ 1080 ZZ$=S1$:S1$="":PRINT#1
        ,"B-P";2;VL-3
EP 1090 FOR L=1 TO 30
QE 1100 GET#2,BY$:IF BY$="" TH
        EN BY$=Z$
XH 1110 IF L=20 AND BY$=Z$ THE
        N S1$=ZZ$:GOSUB2190:PR
        INTM$(15):GOSUB2210:GO
        TO1530
CF 1120 S1$=S1$+BY$:NEXT
QG 1130 S2$="":AD$="":SS=S
AK 1140 FOR L=. TO 13:T$(L)=""
        :NEXT
QF 1150 KK=144:IF FL THEN KK=4
QX 1160 PRINT#1,"U1";2;.;T;.:P
        RINT#1,"B-P";2;KK
XC 1170 FOR L=1 TO 16
GJ 1180 GET#2,BY$:IF BY$=SS$ T
        HEN1200
QS 1190 T$(1)=T$(1)+BY$:NEXT
KH 1200 TK=ASC(MID$(S1$,20,1))
        :SK=ASC(MID$(S1$,21,1)
        )
HJ 1210 PRINT#1,"U1";2;.;TK;SK
ED 1220 PRINT#1,"B-P";2;68
```

```
SD 1230 FOR L=1 TO 187:GET#2,B
        Y$:IF BY$="" THEN BY$=
        Z$
QS 1240 S2$=S2$+BY$:NEXT:CLOSE
        2:CLOSE1
CG 1250 T$(.)=TX$:T$(2)=C$(ASC
        (MID$(S1$,23,1)))
CS 1260 FOR L=10 TO 27
FG 1270 BY$=MID$(S2$,L,1):IF B
        Y$=Z$ THEN1290
JG 1280 T$(3)=T$(3)+BY$:NEXT
HK 1290 T$(4)=C$(ASC(MID$(S1$,
        22,1))+15)
GA 1300 X=ASC(MID$(S1$,29,1))+
        ASC(MID$(S1$,30,1))*25
        6
XQ 1310 T$(5)=STR$(INT(X/4))+"
        K{2 SPACES}"+STR$(X)+"
         BLOCKS"
KA 1320 MM=ASC(MID$(S1$,25,1))
        :DD=ASC(MID$(S1$,26,1)
        ):YY=ASC(MID$(S1$,24,1
        ))
EE 1330 HH=ASC(MID$(S1$,27,1))
        :NN=ASC(MID$(S1$,28,1)
        )
GB 1340 T$(6)=STR$(MM)+"/"+STR
        $(DD)+"/"+STR$(YY)
PS 1350 X$=STR$(NN):IF LEN(X$)
        =2 THEN X$=" 0"+RIGHT$
        (X$,1)
JX 1360 T$(6)=T$(6)+" "+STR$(H
        H)+":"+X$
AH 1370 IF FG THEN FG=.:RETURN
DF 1380 FOR L=30 TO 47
FQ 1390 BY$=MID$(S2$,L,1):IF B
        Y$=Z$ THEN1410
QM 1400 T$(7)=T$(7)+BY$:NEXT
GB 1410 WP=ASC(LEFT$(S1$,1))
DK 1420 IF WP>133 THEN T$(8)="
        YES":GOTO1440
HP 1430 T$(8)="NO"
PE 1440 Q=2:FOR L=2 TO 6 STEP
        {SPACE}2
BX 1450 X=ASC(MID$(S2$,L+2,1))
        +ASC(MID$(S2$,L+3,1))*
        256
SS 1460 GOSUB2240:AD$=AD$+A$:T
        $(9)=T$(9)+Q$(L-Q)+A$
AR 1470 Q=Q+1:NEXT
RX 1480 X=93:FOR I=10 TO 13
JX 1490 FOR L=X TO X+28
XJ 1500 BY$=MID$(S2$,L,1):IF B
        Y$=Z$ THEN1530
DB 1510 T$(I)=T$(I)+BY$
PD 1520 NEXT L:X=X+29:NEXT I
SB 1530 CLOSE2:CLOSE1:GOSUB220
        0:GOTO380
GB 1540 REM***UPDATE SCREEN***
SJ 1550 PRINTHM$"{3 DOWN}"
XA 1560 FOR L=. TO 9
CD 1570 PRINTTAB(TX+10)T$(L)LE
        FT$(S$,21-LEN(T$(L)))
AC 1580 NEXT:PRINT
QS 1590 FOR L=10 TO 13
SE 1600 PRINTTAB(TX+3)T$(L)LEF
        T$(S$,29-LEN(T$(L)))
DQ 1610 NEXT:RETURN
KS 1620 REM***ENCODE & WRITE**
        *
DF 1630 GOSUB2190:IF T$(.)=""
        {SPACE}THEN PRINTM$(12
        ):GOSUB2210:GOSUB2200:
        GOTO400
KR 1640 PRINTM$(13):GOSUB2210
```

```
DM 1650 IF K$<>"Y" THEN1950
SX 1660 GOSUB2190:PRINT M$(7):
        FOR L=. TO 5:TT$(L)=""
        :NEXT
MB 1670 FOR I=. TO 1
BG 1680 X=LEN(T$(I)):TT$(I)=T$
        (I)
GP 1690 IF X<16 THEN FOR J=1 T
        O 16-X:TT$(I)=TT$(I)+S
        S$:NEXT J
DE 1700 NEXT I
BF 1710 L=2:FOR I=3 TO 7 STEP
        {SPACE}4
HA 1720 X=LEN(T$(I)):TT$(L)=T$
        (I)
CE 1730 IF X<18 THEN FOR J=1 T
        O 18-X:TT$(L)=TT$(L)+Z
        $:NEXT J
QR 1740 L=3:NEXT I
KJ 1750 DT$=CHR$(YY)+CHR$(MM)+
        CHR$(DD)+CHR$(HH)+CHR$
        (NN)
QJ 1760 FOR L=1 TO 9 STEP 4
SM 1770 X$=MID$(AD$,L,4):GOSUB
        2290
QH 1780 HI=INT(X/256):LO=X-HI*
        256
HX 1790 TT$(4)=TT$(4)+CHR$(LO)
        +CHR$(HI):NEXT
BD 1800 FOR L=10 TO 13:TT$(5)=
        TT$(5)+T$(L):NEXT
CJ 1810 X=LEN(TT$(5))
DC 1820 IF X<95 THEN FOR L=1 T
        O 95-X:TT$(5)=TT$(5)+Z
        $:NEXT
ED 1830 S1$=CHR$(WP)+MID$(S1$,
        2,2)+TT$(.)+MID$(S1$,2
        0,4)+DT$+MID$(S1$,29,2
        )
CF 1840 TM$=CHR$(WP)+MID$(S2$,
        2,2)+TT$(4)+TT$(2)+MID
        $(S1$,28,2)
AB 1850 S2$=TM$+TT$(3)+MID$(S2
        $,48,45)+TT$(5)
DB 1860 OPEN1,DN,15,"I0":OPEN2
        ,DN,2,"#"
AC 1870 PRINT#1,"U1";2;.;T;SS:
        PRINT#1,"B-P";2;VL-3
PR 1880 PRINT#2,S1$;:PRINT#1,"
        U2";2;.;T;SS
HB 1890 CLOSE2:CLOSE1:OPEN1,DN
        ,15,"I0":OPEN2,DN,2,"#
        "
QB 1900 PRINT#1,"U1";2;.;T;.:P
        RINT#1,"B-P";2;KK
QG 1910 PRINT#2,TT$(1);:PRINT#
        1,"U2";2;.;T;.
CA 1920 CLOSE2:CLOSE1:OPEN1,DN
        ,15,"I0":OPEN2,DN,2,"#
        "
EF 1930 PRINT#1,"U1";2;.;TK;SK
        :PRINT#1,"B-P";2;68
EB 1940 PRINT#2,S2$;:PRINT#1,"
        U2";2;.;TK;SK
JR 1950 CLOSE2:CLOSE1:GOSUB220
        0:GOTO400
SA 1960 REM***PRINTER DUMP***
QH 1970 GOSUB2190
BQ 1980 IF T$(.)="" THEN PRINT
        M$(11):GOSUB2210:GOTO2
        040
FH 1990 OPEN4,4,7:CLOSE4:IF ST
        <>0 THEN PRINTM$(14):G
        OSUB2210:GOTO2040
GC 2000 PRINTM$(4):OPEN4,4,7
```

```
HD 2010 FOR L=. TO 9:PRINT#4,C
        H$(L)T$(L):NEXT
RB 2020 PRINT#4:FOR L=10 TO 13
JX 2030 PRINT#4,"L"CHR$(L+39)"
        :"T$(L):NEXT:CLOSE4
XF 2040 GOSUB2200:GOTO400
AC 2050 REM***COMMAND LINE***
SG 2060 TX$="":GOSUB2190
AA 2070 GET K$:V=ASC(K$+Z$)
GH 2080 IF (V>31 AND V<96) OR
        {SPACE}(V>192 AND V<21
        9) OR V=20 THEN2110
HQ 2090 IF V=13 THEN2170
CE 2100 GOTO2070
AB 2110 IF TX$="" AND V=20 THE
        N2070
XD 2120 IF LEN(TX$)>=LN AND V<
        >20 THEN2070
AE 2130 PRINTK$;
KB 2140 IF V>192 THEN K$=CHR$(
        V-96)
RB 2150 IF V<>20 THEN TX$=TX$+
        K$:GOTO2070
FC 2160 TX$=LEFT$(TX$,LEN(TX$)
        -1):GOTO2070
SX 2170 GOSUB2200:RETURN
RG 2180 REM***SET, CLEAR, WAIT
        ***
RX 2190 PRINTHM$DM$R$":";:RETU
        RN
CJ 2200 PRINTHM$DM$R$S$"
        {4 SPACES}"HM$:RETURN
KM 2210 GET K$:IF K$="" THEN22
        10
MM 2220 RETURN
GH 2230 REM***DEC-HEX, HEX-DEC
        ***
CR 2240 A$="":Z=1:FOR I=1 TO 3
EE 2250 V=INT(X/(4096/Z)):A$=A
        $+MID$(HX$,V+1,1)
EQ 2260 X=INT(X-V*(4096/Z))
SC 2270 Z=Z*16:NEXT
KD 2280 A$=A$+MID$(HX$,X+1,1):
        RETURN
HX 2290 A$="":X=.:FOR I=1 TO 4
KK 2300 A$=MID$(X$,5-I,1)
EM 2310 FOR J=1 TO 16
HA 2320 IF A$=MID$(HX$,J,1) TH
        EN2340
EQ 2330 NEXT J
AS 2340 X=X+(16↑(I-1))*(J-1):N
        EXT I:IF X>65535 THEN
        {SPACE}X=.
GC 2350 RETURN
PP 2360 REM***QUIT***
AA 2370 CLOSE2:CLOSE1:PRINT"
        {CLR}"CHR$(142):END
XF 2380 DATA" FILENAME:",16,"
        {5 SPACES}DISK:",16,"
        {5 SPACES}TYPE:",.
QC 2390 DATA"{4 SPACES}CLASS:"
        ,18,"STRUCTURE:",.,"
        {5 SPACES}SIZE:",.
JE 2400 DATA" MODIFIED:",10,"
        {3 SPACES}AUTHOR:",18
RJ 2410 DATA"WRTE PTCT:",1,"
        {3 SPACES}MEMORY:",12,
        "{4 SPACES}NOTES:",1
XX 2420 DATA"CBM PRG","BASIC P
        RG","ASSEMBLY PRG"
JC 2430 DATA"DATA FILE","SYSTE
        M FILE","DESK ACCESSOR
        Y"
FA 2440 DATA"APPLICATION","APP
        LICATION DATA","FONT F
        ILE"
PA 2450 DATA"PRINTER DRIVER","
        INPUT DRIVER","DISK DR
        IVER"
PP 2460 DATA"SYSTEM BOOT FILE"
        ,"TEMP","AUTO-EXEC"
DP 2470 DATA"SEQUENTIAL","VLIR
        "
BH 2480 DATA"$","-$"," EXA:$"
HA 2490 DATA"-=>GEOINFO EDITOR
        <=-"," {RVS}D{OFF}:DIR
        ECTORY {RVS}C{OFF}:DIS
        K CMD{4 SPACES}{RVS}Q
        {OFF}:QUIT"
PR 2500 DATA" {RVS}R{OFF}:READ
         {RVS}W{OFF}:WRITE
        {RVS}P{OFF}:PRINT","PR
        INTING..."
XC 2510 DATA"FILE NOT FOUND.",
        "READING & DECODING...
        ","ENCODING & WRITING.
        .."
XJ 2520 DATA"NO FILE SELECTED.
        ","THIS CAN'T BE CHANG
        ED.","PRESS ANY KEY."
PS 2530 DATA"NOTHING TO PRINT.
        ","NOTHING TO WRITE.",
        "ARE YOU SURE (Y/N)?"
MC 2540 DATA"PRINTER NOT READY
        .","INPUT NOT A GEOS F
        ILE."
```

⊡

KEVIN DIXON

STAR STRIKE

BEFORE YOU CAN ATTACK AN ENEMY SPACE STATION, YOU MUST FIRST DISABLE THE GENERATORS THAT POWER ITS CLOAKING DEVICE IN THIS ARCADE-STYLE GAME FOR THE 64

The evil Gorn system has established a secret base in your galaxy and plans to launch a major attack. Your mission is to find the enemy base and destroy it.

Finding the enemy base will not be easy. It has a cloaking device that makes it invisible to your ship's scanners, and its shield protects it from your fire. Its only weak points are the four generators that supply its power. If you can disable these generators and render the base visible, you can destroy it and stop the Gorn invasion.

Star Strike is a one-player game that requires quick reflexes and a good memory. It also takes some patience.

Getting Started

Star Strike is written entirely in machine language, but it loads and runs like a BASIC program. Enter the program with *MLX,* our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1808

When the title screen appears, plug a joystick into port 1 and press the fire button. You'll see your mother ship in the middle of the screen with your ship docked alongside. You'll find your score at the top of the screen, along with the number of lives you have remaining, the amount of energy you have, the sector you are in, and the number of generators you have destroyed. You'll always start in sector 11 with 2500 units of energy and four spare lives.

To maneuver your ship, use the joystick. Push left and right to rotate your ship. Push forward to thrust in the direction it's pointing. Press the fire button to launch a photon blaster. Pull back on the stick to activate your hyperspace device to jump to another sector. As you fly around the galaxy, your energy decreases. Firing the photon blaster uses one energy unit. Using hyperspace depletes 100 energy units.

When you move off the edge of the screen, you'll move into an adjacent sector. There are 64 sectors in the galaxy, arranged in an 8 × 8 grid. The first number in the sector indicator is the *x* location, and the second is the *y* location, so sector 11 is the first sector, and 88 is the last.

As you explore the area, you'll see quite a few asteroids in different sectors. These asteroids have gravity, and if you are not careful, they'll pull your ship in, and you'll be destroyed. Colliding with an asteroid decreases your overall energy supply rather quickly. If you are lucky, you can hit an asteroid and survive, but your energy will be very low.

Your mother ship also has gravity. When you wish to dock with it to replenish your energy, return to sector 11 and fly close to the gray landing pad. When you approach the pad, slow down and let the mother ship's tractor beam pull you in. When you are docked, your energy will be resupplied to 2500 energy units. Whenever your ship is docked, it is protected by the mother ship's shields.

Before you can destroy the enemy base, you must find the four generators that are supplying power to the base's cloaking device and shields. The generators are hidden inside four asteroids somewhere in the galaxy.

You must search the galaxy, firing your photon blaster at asteroids. An asteroid must be hit about 30 times before it will explode. If a generator is hidden inside, it will appear after the asteroid disintegrates. Generators look like large red diamonds, and you must hit them about 30 times before they will explode. After a generator has been destroyed, one of the Xs in the upper right corner of the screen will become reversed, indicating that you have one less generator to find and destroy.

As you search for generators, the enemy base launches homing robot missiles at you. You'll hear an alarm from your ship's sensors whenever a missile is launched. Missiles track your movement and follow you, no matter where you go in the galaxy. You can't outrun these missiles, but you can outmaneuver them. If a missile hits you, you lose 500 units of energy. You can destroy missiles if you hit them with four shots of your photon blaster, and they're also vulnerable to collisions with an asteroid or your mother ship.

When a missile enters your sector, pay attention to what direction it came from. The enemy Gorn base is in that direction. Sometimes you can locate the base before all four generators are destroyed. If a missile suddenly appears in your sector and your launch alarm goes off simultaneously, you'll know that the enemy base is in that sector, even though you can't see or hit it. Remember the sector number, because the base will be there when you have destroyed all four generators and made it vulnerable.

Once you have destroyed all four generators and have located the base, start attacking it. Its shields will be down, but it can now launch missiles more frequently. The base has to be hit about 200 times with your blaster before it can be destroyed, so be prepared to return to your mother ship for energy. You'll probably find it necessary to return several times during a game, as missiles sap your energy.

If you manage to destroy the base, head back to your mother ship and dock. You'll receive bonus points for the number of lives you have remaining.

If you find yourself in trouble—for example, you're heading straight for an asteroid or you're surrounded by missiles—you can escape by using your hyperspace device. Use the hyperspace sparingly, however, as it costs 100 units of energy. Also, you may find yourself landing right on top of a deadly asteroid.

If you wish to pause the game at any time, press Run/Stop. Press any other key to resume play.

STAR STRIKE

```
0801:0B 08 70 17 9E 32 34 30 6E
0809:37 00 00 00 20 20 20 20 96
0811:20 20 20 20 20 A0 C4 B9 06
0819:3C 08 99 F8 00 B9 FD 08 F6
0821:99 33 03 88 D0 F1 A0 09 4C
0829:B9 0C 08 99 FF 03 88 D0 A1
0831:F7 A9 3C 85 2D A9 1F 85 5B
0839:2E 4C 00 01 11 EA 04 3C FB
0841:1F 81 16 B9 6E 09 99 E8 53
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 0A A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0A 20 34 03 85 1D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FF 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 1E A2 08 21
0899:20 34 03 A0 02 84 A8 85 2A
08A1:A6 18 A5 FC 65 A6 85 F7 58
08A9:A5 FD 65 A7 85 F8 20 6C EF
08B1:03 4C 13 01 E8 20 34 03 FB
08B9:D0 1C A0 03 84 A8 E8 20 36
```

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08C1:34 03 F0 08 A2 08 20 34 F4
08C9:03 4C 5C 01 A2 0F 20 34 CF
08D1:03 E6 A7 4C 5C 01 E8 20 AF
08D9:34 03 D0 0A E8 20 34 03 B2
08E1:18 69 04 A8 D0 D6 E8 20 37
08E9:34 03 D0 0A A2 02 20 34 21
08F1:03 18 69 06 D0 ED A2 08 A2
08F9:20 34 03 D0 E6 A9 00 85 F7
0901:A7 A4 FB F0 0C 06 FA 2A 37
0909:26 A7 C6 FB CA D0 F2 A8 D8
0911:60 48 B1 FE 85 FA A9 08 FE
0919:85 FB 68 A4 FE D0 02 C6 4A
0921:FF C6 FE C0 E7 D0 DE A4 B5
0929:FF C0 07 D0 D8 A9 37 85 BA
0931:01 58 4C 00 0E A4 A8 F0 A8
0939:22 A5 F7 38 E5 A8 B0 03 7E
0941:C6 F8 38 85 F7 A5 FC E5 8A
0949:A8 B0 02 C6 FD 85 FC B1 3A
0951:F7 88 91 FC 98 D0 F8 C4 42
0959:A9 F0 0A B1 F7 C6 FD C6 76
0961:F8 C6 A9 10 EC 60 78 E6 98
0969:01 4C 16 08 60 20 08 0A EF
0971:00 9E 33 35 38 34 20 22 D9
0979:0E 5E 4B 60 C0 0B 44 49 9D
0981:58 91 20 BA E1 05 8D 10 22
0989:78 08 F1 38 A8 63 20 23 D1
0991:66 66 80 7E 00 70 14 0F 61
0999:34 42 C0 5F FC 06 C0 57 3D
09A1:7C 22 05 C4 72 C1 53 FC A5
09A9:07 30 84 BE 3C F4 08 18 A5
09B1:10 05 82 00 0E 21 00 C1 14
09B9:53 CC 07 88 FE 2D 06 9F 6A
09C1:1F 00 1C 3F C5 5F 80 C8 50
09C9:0B 10 33 00 A2 2D 40 F4 0B
09D1:54 F0 F9 48 14 0B 01 E2 BF
09D9:A7 E0 07 C0 01 0F 80 A3 CD
09E1:A7 CA 21 47 A2 58 28 0A E3
09E9:01 84 50 91 07 20 E6 00 47
09F1:44 1B 80 D0 A9 F2 90 79 BD
09F9:28 10 00 70 FC 17 3C C5 AD
0A01:7C A1 B3 E5 20 13 59 2C BC
0A09:16 85 C5 5F 91 57 F4 04 10
0A11:C0 58 7C 1E 8A 85 A2 A0 5D
0A19:7C C9 DF F8 01 80 4C F9 06
0A21:48 C4 21 04 20 78 8A 9F 86
0A29:02 B6 04 E1 C9 F2 F7 79 0E
0A31:70 68 84 E2 C8 07 81 1C D7
0A39:E6 E7 CB 4C 07 18 40 2C 3E
0A41:3C 34 02 3E F2 B3 38 F3 6F
0A49:F3 E5 AC 23 50 08 00 E0 1C
0A51:F8 2F 7E 33 9A 9F 2F 85 E7
0A59:03 AF 85 0F 1D 01 E0 3F 6A
0A61:69 04 07 E4 E7 CB 5D E7 6B
0A69:A1 03 11 DA 7F F9 D9 E0 57
0A71:29 F4 B6 0A 7C 24 E2 3F 48
0A79:80 00 1F 14 0E 10 9B 08 E2
0A81:9D 9C 2C A9 1F 86 38 0A 39
0A89:1E 1A A1 32 8F 81 B0 E6 55
0A91:A1 58 28 0A EA C0 2A D3 B4
0A99:0C 9C 3A 80 97 5C 0F 05 7B
0AA1:00 A3 06 5E 8A 94 62 A4 55
0AA9:E8 28 2E 8A 88 62 A1 28 E3
0AB1:9A AA 98 9A FE 98 1B FF 0B
0AB9:90 1F 57 D0 FD 55 FC F5 0B
0AC1:A9 7C 3E AA F0 0F AB E8 40
0AC9:05 AF EF 2E 02 60 04 D8 9F
0AD1:C6 8D 4C C1 92 61 52 80 91
0AD9:14 1A 05 05 38 14 08 85 17
0AE1:40 5F F5 5C 2A A5 5C 08 1B
0AE9:A9 5C 2E 2A A0 3B 3D F0 AF
0AF1:2E 06 40 3B 02 00 2E DF A6
0AF9:05 3B 64 F1 C2 88 00 FC 40
0B01:00 07 96 00 19 69 C0 3E D9
0B09:99 40 5B A9 50 57 D9 F0 86
0B11:69 A7 F0 F5 6A 7C EA A6 05
0B19:68 FB 66 7B F0 4E 55 58 AA
```

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0B21:1F 79 DD 3E 55 95 07 AE 82
0B29:95 0E E9 66 01 DD 76 00 9D
0B31:BF 5F 00 DE EC 00 0F BC 2F
0B39:00 02 D8 3A 78 9F 7B 86 4E
0B41:60 00 3F 50 02 E5 9C 03 58
0B49:5E B4 06 59 BB 09 B6 7B FC
0B51:0A BA 57 36 59 E5 3D 5D A3
0B59:5D 16 77 6D DE 57 59 D6 47
0B61:7A DF DD EA 64 DD E7 64 E5
0B69:BF 75 B4 2D 56 70 3E B9 D0
0B71:E0 05 A5 80 0D 5E 8B 0D FB
0B79:1F D5 22 04 B0 00 CA 86 BA
0B81:D2 E2 11 51 2C 40 41 0D E2
0B89:A9 C0 03 67 2B DC 20 02 8A
0B91:30 C2 F1 E2 4C 59 1C 07 E3
0B99:A9 33 E5 31 B1 E1 21 50 C8
0BA1:04 01 C8 3F 48 9C 78 20 CC
0BA9:DC 51 3C 87 6E 06 02 07 19
0BB1:05 03 08 01 04 FF F9 FD 2E
0BB9:F8 FA FC F7 FE FB D5 33 F0
0BC1:EF DF BF 05 13 95 22 43 86
0BC9:A2 CC 49 46 45 44 20 C5 33
0BD1:4E B0 10 47 59 5A 28 12 48
0BD9:D3 45 43 54 4F 52 3A 1D 2E
0BE1:1D 20 58 58 58 9D 94 58 D9
0BE9:00 C7 41 4D 45 20 4F 56 8E
0BF1:45 52 AA C1 9F C3 88 47 15
0BF9:52 02 0D 55 4C 41 54 A0 61
0C01:42 53 21 C5 CD 21 0D 53 EF
0C09:49 A4 20 41 43 43 4F 4D 1A
0C11:50 4C 49 53 48 45 44 21 C3
0C19:00 05 22 BD C1 D2 20 20 4C
0C21:D3 D4 D2 C9 CB C5 00 42 07
0C29:59 20 CB 45 56 49 4E 20 58
0C31:C4 49 58 4F 4E 00 31 39 0C
0C39:39 30 80 07 1F 00 06 20 9F
0C41:09 05 09 00 80 14 00 51 E5
0C49:28 14 06 20 F7 FB F7 00 DC
0C51:F7 05 C0 01 F7 09 FB 36 E0
0C59:18 D0 1C 64 0C 14 12 00 50
0C61:00 F4 20 89 3C 90 04 20 9F
0C69:00 10 84 10 B9 10 42 10 B9
0C71:E3 3C 00 02 60 20 00 27 55
0C79:00 04 02 01 68 A0 08 80 39
0C81:81 00 9C 00 10 03 02 A0 1F
0C89:81 22 00 06 00 72 02 40 59
0C91:04 03 80 06 8A 00 18 C8 2A
0C99:00 09 00 01 01 04 01 00 1E
0CA1:A2 00 AC 03 0E E2 7E FD C7
0CA9:42 FA 27 2E F0 30 59 AB 10
0CB1:04 F0 08 AA CE 41 1C 4C B3
0CB9:A3 10 4A 86 05 08 CE 34 73
0CC1:14 D0 10 E4 00 20 20 80 A9
0CC9:AF 5F D1 59 04 E0 18 14 49
0CD1:DF 0C 01 86 A2 48 F0 0F 8C
0CD9:A0 24 86 CE 61 D6 73 C6 1D
0CE1:0B AA AC 16 04 D0 74 20 8D
0CE9:60 E0 29 FB 84 4E E0 A0 0F
0CF1:FB A9 20 85 FC 3D 0F D8 A2
0CF9:85 FE A2 08 E8 76 B1 FD EB
0D01:91 FB 88 D0 F9 E6 FC E6 4D
0D09:FE CA D0 F0 A5 01 09 04 C5
0D11:85 01 AD 70 27 09 90 54 BD
0D19:0E DC A0 00 B9 20 0F 99 8B
0D21:00 24 C8 C0 20 D0 F5 E8 82
0D29:37 07 5A CE AD 05 D0 55 51
0D31:C2 15 10 42 50 BC 3A 60 62
0D39:BC 07 44 04 82 24 9C 34 4E
0D41:09 08 3B 09 AA 4D C2 01 EA
0D49:4E 42 BA 33 01 EA 0B 8D FC
0D51:04 36 15 1A C9 02 11 83 3B
0D59:10 AB 64 8A 38 21 8D F8 F5
0D61:A3 85 24 F0 06 A9 81 04 20
0D69:54 C8 A1 A7 20 78 17 1F BE
0D71:49 1F 29 1D D0 0D A9 0A 07
0D79:58 DC E5 80 C8 93 C2 20 F5
0D81:E0 02 44 43 C6 43 10 F3 A0
0D89:CE D0 3C 14 2B C9 CD 05 29
0D91:50 43 1A 08 EE C8 07 CC DD
0D99:19 5E 0E CE F0 04 AD 34 AD
0DA1:E8 0C 80 C1 A0 1B CE 68 D6
0DA9:06 D0 46 A9 03 8D 3B DC FF
0DB1:06 0E 0A 60 60 00 E2 51 B3
0DB9:07 03 78 CC 0B 90 06 A7 42
0DC1:8A C0 FA 71 18 B9 01 60 D1
0DC9:B1 25 80 18 C9 00 06 03 F4
0DD1:94 80 4B 9D 00 09 90 04 E2
0DD9:2F 64 80 21 31 C0 8D C1 30
0DE1:61 C8 A1 C3 E0 60 D6 07 8C
0DE9:65 BE 80 02 10 5D DE 99 E3
0DF1:00 8E 04 E2 24 C3 23 02 D6
0DF9:4E 8A 7A 4C 59 3A B9 43 5C
0E01:1C 4E 04 1A 63 58 42 14 F5
0E09:F0 21 70 11 67 3B 11 B0 FF
0E11:15 20 79 3C 4C 81 E4 90 75
0E19:A8 B9 70 0E DD 9B 90 03 68
0E21:20 62 67 85 01 EC 0A 09 04
0E29:9D 16 38 9D 3A D0 2A FB DF
0E31:74 EA E0 C9 F0 C7 E1 C9 2F
0E39:38 E9 E2 A9 F4 87 27 DE D5
0E41:1E 9E 3B B4 07 84 C4 80 1B
0E49:2C A9 9A F0 C9 70 6F 2A 61
0E51:0E 01 30 27 4C 8C 50 25 87
0E59:50 18 69 10 60 D2 04 C2 EA
0E61:2A 3A 47 A0 40 C4 01 E6 12
0E69:58 75 F0 11 78 41 D0 40 E8
0E71:54 83 4C 54 77 61 18 ED C6
0E79:E8 00 56 1D 5A 19 5B 3E D2
0E81:5A 19 2F DE F1 68 C5 50 F1
0E89:A3 15 DE 8F 56 1C 48 85 CA
0E91:6C 41 13 1E 89 FF D0 42 A8
0E99:3C 95 A2 59 80 41 1F AF 1A
0EA1:12 A0 5E 06 04 9E 80 2F E5
0EA9:51 15 60 84 1F C9 07 D0 07
0EB1:0C 38 70 8F FD E4 86 40 B9
0EB9:CC 05 04 12 28 8A 01 C6 53
0EC1:0E 80 10 D0 FE 23 DC 21 73
0EC9:18 E8 1C 11 88 19 05 FE 72
0ED1:00 D0 87 27 20 04 10 98 4F
0ED9:38 13 2D 02 2C C0 8A 79 8F
0EE1:80 F1 42 AD 80 03 35 38 90
0EE9:E9 0C 4A 4A AA 76 00 14 2F
0EF1:87 04 06 C0 42 E4 10 18 7D
0EF9:A9 28 D1 A1 C2 23 F0 18 E5
0F01:8A 65 FD 85 FD 0E B8 65 D4
0F09:FE 3B 1D A5 FE 54 70 D4 72
0F11:85 FE 60 20 AF 13 20 50 1A
0F19:13 A9 23 CA 6B E3 58 2F 07
0F21:18 30 0A A8 C8 C4 29 3F 0E
0F29:C9 28 B0 F7 AA 20 D5 12 5F
0F31:D0 F1 CE AA AD 8A 03 3A 90
0F39:06 04 CC 01 AA 8A 29 03 D9
0F41:09 80 00 70 03 40 20 FE 63
0F49:12 B0 85 01 91 FD EE 2F EE
0F51:C2 27 05 A9 20 40 09 04 ED
0F59:88 05 99 28 06 99 E8 06 21
0F61:88 D0 F1 80 71 0E 34 E1 4C
0F69:C8 88 28 D0 E3 1C 41 AF E1
0F71:03 2E 60 A9 33 4F 77 60 69
0F79:18 AD D7 6D 82 44 14 38 66
0F81:06 02 8D 41 48 0A 04 8D E8
0F89:D1 AD 10 04 8D 81 AD 10 1C
0F91:95 03 61 60 AE 40 11 8E 94
0F99:63 34 64 D0 0C 65 0E E8 0B
0FA1:8E 66 B4 AA 01 8D 9C 02 5B
0FA9:20 8C 13 CE 1D 05 41 60 2A
0FB1:30 3A 03 0C B8 80 4C 74 6C
0FB9:14 7D E8 00 C2 D6 40 A0 F0
0FC1:0D 88 B9 02 51 36 D0 80 65
0FC9:09 60 6C 24 30 00 11 04 FB
0FD1:16 08 65 A4 0B 26 8D B0 B0
0FD9:2E 20 5D A0 40 8D F5 04 F4
0FE1:D7 02 42 1B 82 35 64 A6 BE
0FE9:50 28 2E 64 9A 0B 69 14 2E
0FF1:52 25 C8 10 63 26 C0 48 1A
0FF9:2C 97 0F 06 20 81 13 4C CF
1001:57 14 E0 F2 02 28 29 20 40
1009:D0 0A 79 DD 05 14 AD 3E 33
1011:80 80 90 91 07 BF D0 18 AD
1019:69 12 D8 2E 20 18 00 80 52
1021:38 0C 00 82 F3 40 5C 0E EF
1029:60 74 58 36 09 80 99 00 82
1031:3C 2B EB 76 20 11 F0 F9 40
1039:8D 7A 1F B0 00 B7 04 0D A1
1041:17 80 D0 F6 A0 00 FD 0F A6
1049:10 12 06 F0 F8 4A A3 29 27
1051:77 F0 F1 40 FE 12 EC AA 70
1059:BD F0 42 06 E6 A9 3F 1C B5
1061:42 C0 04 B0 57 BF 9D 80 D3
1069:90 C8 C0 21 D0 D3 47 7C 0F
1071:0A 4A 07 04 3D A0 0E 03 D5
1079:4C 35 15 CE 58 03 10 A9 35
1081:28 8D 04 C4 13 68 CB 80 38
1089:2F 10 84 03 0D 72 00 06 3E
1091:43 06 39 80 D8 24 4C 16 0A
1099:50 61 30 0C 80 03 91 40 74
10A1:AC 0D E0 F0 17 B0 13 82 AA
10A9:61 80 0E 8E 22 81 50 80 7D
10B1:62 00 1C 79 04 02 29 A3 3C
10B9:B8 41 AD 5F B3 1A 40 E0 99
10C1:60 06 20 A0 1B AD 06 D8 16
10C9:79 88 00 6E 0A 40 08 56 67
10D1:06 8D 8C 11 B8 00 F0 0B AD
10D9:B4 3E EB 4C 76 15 13 AB FF
10E1:63 B5 60 2C 8A 33 3E 0A 97
10E9:0A A8 A2 00 B9 40 0F F0 6B
10F1:28 8D 63 04 88 04 EB 49 AB
10F9:D8 38 81 04 DD 49 D8 E0 AB
1101:81 04 BB 15 4A C9 68 16 0E
1109:06 20 0F 16 4C B4 15 C8 A1
1111:E8 E0 04 D0 CD 98 BF C4 82
1119:81 57 BC 18 34 2F 75 C4 F8
1121:6C 40 15 14 CE 12 33 F4 87
1129:0F C5 EE 4E 4C 71 02 D0 04
1131:F0 41 82 84 50 86 63 AD C5
1139:C7 C9 FF D0 08 01 0F 09 2A
1141:02 AB 67 00 EE 02 55 53 B9
1149:24 C9 38 D0 03 A0 12 80 43
1151:CE 03 A2 03 10 70 06 0C 7A
1159:81 00 FD 4E 46 06 07 00 39
1161:F0 12 AE EB 0A 79 12 0D 7C
1169:9A 38 48 C8 F8 06 2D 39 EF
1171:0E 70 DE 00 DE 9C 04 40 44
1179:35 10 99 F0 3A DF 6C 64 0B
1181:B8 F0 27 56 07 07 8D 59 4F
1189:2F 80 3F C0 58 D8 8D 31 C9
1191:81 84 70 9C FA 01 86 09 5F
1199:88 0F 07 AA 4C B6 16 D8 91
11A1:74 00 97 F0 1F B0 10 E7 C3
11A9:C3 1C 23 13 FE 44 2D DA 88
11B1:60 2C BD 73 0C 00 64 E3 0B
11B9:1D 98 8A B2 F0 19 B0 0D 67
11C1:92 21 09 F0 10 FE 13 58 A0
11C9:FB 16 BD C0 19 C9 F7 F0 04
11D1:03 DE 68 60 B4 98 01 7C C6
11D9:70 92 F0 77 AA D8 00 72 99
11E1:4E 18 40 6A 9E 30 00 02 97
11E9:AE 02 D0 AC 03 76 18 40 2B
11F1:C9 3A 27 0C 80 35 53 93 40
11F9:E1 02 B3 01 18 A9 06 9D 25
1201:92 05 EA 8A 8A 00 11 53 7F
1209:51 BC 05 88 8C 4C 7A 17 CF
1211:EE 08 40 A9 5F 17 5E 00 65
1219:1D 16 DE 4F 07 FE 36 08 CA
1221:F0 11 DE 41 D0 07 BD 51 61
1229:C5 66 A0 A0 A9 07 D2 29 20
1231:08 C0 0A 40 A4 02 B9 80 EF
1239:07 D9 07 C0 54 83 57 D0 74
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1241:4F A2 01 E8 60 BB 48 1A 01
1249:D9 D0 F6 A9 04 12 AB AD 75
1251:41 9D 91 C7 00 9D 08 0E C0
1259:9D E6 79 80 0A 9D 02 BD C5
1261:77 0E 2D 43 6A 02 C1 09 86
1269:14 03 60 66 35 43 A9 5F 34
1271:A1 2A 97 25 E0 23 15 9D 91
1279:60 21 B9 0A 1F 01 2C 9D E0
1281:4B 60 50 C2 E2 F0 54 DE FB
1289:E3 4C E0 00 F0 0C E0 07 4F
1291:F0 21 AA F8 0E 64 4C 57 4D
1299:18 76 AC 19 8C 90 02 38 71
12A1:10 92 FE 13 52 74 00 88 70
12A9:53 02 60 83 1A C7 1B 80 E2
12B1:37 8D AA 85 86 02 2E 33 4E
12B9:51 10 29 7F 90 01 01 00 32
12C1:8D EB 8D 58 B8 FE 27 D0 BF
12C9:6D 7E 67 E7 20 20 5F CF BF
12D1:41 00 5A E7 20 80 C1 10 F6
12D9:52 60 42 29 01 AE 3A 0C 5D
12E1:AC 89 00 8E 8E 86 8C 43 92
12E9:3C 00 A4 8A 09 BD 14 54 25
12F1:A8 BD 62 84 BC 20 B6 12 54
12F9:EC 1F 79 09 22 CC 20 8C 2D
1301:1D 48 7A 01 04 35 40 C3 60
1309:83 B5 A0 20 15 5A 50 DD 05
1311:30 CC F0 05 30 03 CE FD 1A
1319:03 3C 0A 71 C9 06 71 29 9A
1321:2A 00 D0 F0 5C C1 5C 0A 32
1329:C3 9E 5D 43 F0 58 5A 19 6F
1331:37 F0 11 AD FF 07 C9 34 10
1339:F0 0A A9 12 8D 64 73 0C A1
1341:A9 10 8D 5B AD 1E 0E 0A B3
1349:AA AD 10 01 4E 38 27 3A 1E
1351:33 B2 50 5C C0 C2 B0 27 27
1359:AD DE 15 5C 21 C8 02 34 DA
1361:90 1B D1 42 38 ED B5 B0 8A
1369:B0 0F 25 0E 18 6D 22 0E F9
1371:DD CE 3D 90 03 24 06 DF 7F
1379:01 82 06 8C 01 63 46 2E 9A
1381:5E 47 2E 19 AD 0B 29 03 EE
1389:D0 52 01 E9 0B C5 00 1C F6
1391:2B 51 32 32 4C B9 1B 20 AA
1399:90 1A AD 00 4B FC 2D 40 2D
13A1:0E 35 AD C8 CD 2E 83 AC 39
13A9:0A 05 00 D0 28 55 01 D0 8C
13B1:23 AD E0 8E 05 1A F1 00 4E
13B9:36 13 3A 28 44 03 12 1C F7
13C1:4B 00 FA F0 D6 45 00 33 FA
13C9:0E EE 32 13 20 A0 AD 07 10
13D1:C5 FA AD 4D 5F D0 F5 AD FB
13D9:96 D0 F0 49 9B EB 39 07 38
13E1:F0 E6 20 1D 16 2D 24 80 3E
13E9:00 D0 17 CE 2B 2D 1D 2D 89
13F1:85 60 83 60 A9 FF 4B 24 71
13F9:5A 1A AB 67 A0 F0 19 3E F8
1401:9B 1F C9 01 F0 26 98 AA 04
1409:DE 1C BE 4C 16 42 07 41 4D
1411:72 4C 1B 1A D0 AD 41 45 8F
1419:A9 06 8D 48 49 2E D0 8D FF
1421:58 88 2E 3C 62 93 A9 7D 53
1429:05 12 87 41 20 F0 0C B9 F3
1431:E6 29 C0 F0 15 09 1F 4C 95
1439:57 1A CE 2C 06 F2 6C 7F 84
1441:1B A9 E1 20 0A 1C AC E1 9B
1449:22 C0 99 80 90 6D 88 01 3A
1451:50 86 65 20 D3 18 D0 27 B9
1459:AE 1E 0E BD 8B 77 D0 1F F8
1461:BD D8 F0 1A BD 84 1D CD 66
1469:2A 0E F0 12 CD F0 39 34 42
1471:0A 9D 57 B0 5A 40 9D 08 13
1479:0D A0 60 CE 65 D0 25 AD AF
1481:62 06 F0 B0 51 4C A5 40 CC
1489:0F 08 92 02 06 30 08 A4 53
1491:CE 2D 05 4C B5 1A EE 0F D4
1499:CA 0F 8D 05 0E 60 A2 00 24
14A1:18 4C F0 FF A0 A7 3C 12 35
14A9:D0 A0 62 10 A7 62 27 9E 63
14B1:8A 0D E8 9F 8A 03 79 2A F6
14B9:36 64 7C 2A 42 38 AD BC 53
14C1:28 E0 2B 40 A8 16 0F E9 45
14C9:00 0D 86 5A C4 6C BC 6F 6C
14D1:C0 4C 34 1B A0 0C C4 AE 13
14D9:D0 34 03 30 50 15 72 50 E6
14E1:32 12 64 9A 84 0D AF C9 5F
14E9:0A B0 03 20 54 1C AE 86 9C
14F1:67 00 20 55 07 AE 72 04 03
14F9:68 4C CD BD A0 21 20 BB 84
1501:1A C2 15 0A 87 0D 39 00 0F
1509:AD 23 0E 17 4A 4A 29 0F E2
1511:18 69 31 00 3C BB A9 04 EF
1519:82 2C 12 11 09 AA A9 98 C1
1521:9D 23 04 CA D0 F8 E3 A3 E5
1529:70 2A D8 08 40 07 3C 06 4E
1531:7F 70 5C 00 A8 0D B1 F0 90
1539:68 0E 20 23 40 B0 83 CE EB
1541:80 58 20 C8 60 88 AC 00 D0
1549:08 89 CD 66 B0 0B 82 EA 9B
1551:0A 04 90 07 4C D9 50 0C 7A
1559:60 38 ED 37 60 1E F0 4C 9C
1561:37 1B 60 06 01 D0 1C AD 8B
1569:33 92 17 AD 32 0E D0 12 0D
1571:80 CF 35 9B 83 49 1C 54 FD
1579:00 46 41 B1 50 B0 04 36 FB
1581:02 0B A2 12 26 49 80 1C 58
1589:90 AD 87 69 40 4A C0 4C E7
1591:C1 1A DD 4C 02 4F 38 02 63
1599:2B 22 FC 16 40 1D 01 5B B6
15A1:18 20 63 1A 60 B9 1D 19 2B
15A9:72 4C 8A 09 48 D8 20 D0 B8
15B1:FB 20 E1 FF F0 FB 28 F8 DE
15B9:DF 60 A9 30 4C 66 20 D7 38
15C1:0F A9 18 A2 C6 81 02 78 C3
15C9:1B 8A 20 80 D4 21 C8 11 FD
15D1:8D 05 88 09 0C C8 13 98 E7
15D9:10 F1 8D 06 18 01 8D 08 82
15E1:81 11 FB 8D 0D 18 F6 8D AD
15E9:14 81 1D 0C 8D 25 19 0B 21
15F1:8D 26 81 11 80 28 8A 40 A7
15F9:40 29 B4 08 2A 88 2C 80 F1
1601:08 2B C8 2D 81 1C 80 8D F2
1609:17 18 1D BF 10 FC 48 35 A0
1611:74 31 8D F9 1A 04 DC FA AA
1619:8A FB 80 08 FC 88 FD 07 27
1621:8D FE 07 A9 0F 00 F0 58 02
1629:D4 D1 0E D4 AD E0 01 84 BA
1631:5C C6 DD 88 20 7A 14 A9 3E
1639:C9 8D 2B 07 3F 04 8D 2C D4
1641:B0 03 60 07 A8 22 1A 40 45
1649:58 03 88 77 D8 00 06 13 D0
1651:A9 81 8D 0B D4 60 70 04 22
1659:A2 09 6A C8 DE 69 88 0D AD
1661:A2 0C AF 21 EC A7 61 A0 53
1669:12 A2 8F 19 EA 00 FB 8C A6
1671:E4 46 39 80 C3 A3 0E 80 1A
1679:B1 9C A9 93 20 D2 FF A9 0A
1681:40 C1 75 01 16 AD 00 5E C2
1689:08 0A 8D 00 1D 08 90 38 50
1691:E9 32 8D 2C BB A9 09 8D D7
1699:16 A1 1A 80 08 18 88 19 4F
16A1:80 08 1B 08 1C 83 10 40 43
16A9:07 B1 B8 40 22 44 8D 8A A8
16B1:8D 60 12 09 61 88 5F 80 FB
16B9:08 08 88 0F 80 14 10 48 AA
16C1:59 8B 08 5A 88 5C 80 08 E2
16C9:5D 88 5B 80 08 33 0E 8D F0
16D1:98 A9 FA 8D 32 11 12 C0 A7
16D9:06 0E A9 7E 3F C2 C7 91 CF
16E1:03 0F 39 27 D0 64 53 AD 59
16E9:35 0E C9 01 D0 0E 07 17 61
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1721:77 8D 23 68 F0 19 60 1B 21
1729:4C 9F 1E 20 98 E0 15 23 C0
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1739:A9 01 A2 00 20 18 11 D0 25
1741:71 A6 4F 79 22 02 84 E6 5C
1749:01 1E 9A B8 19 A9 04 A2 78
1751:02 6C 83 08 A2 03 3C 83 A9
1759:10 A2 04 3C 83 20 A2 05 63
1761:3C 83 40 A2 06 20 1C 1C C5
1769:A9 80 8D 38 0E 49 FF 8D E4
1771:39 0E A2 07 8E 1E DC DE 0A
1779:7E 22 02 FE 17 20 DC 1B AD
1781:20 C8 C0 19 8C 0F 20 C2 3F
1789:0F 4C E3 1D A0 0F 8C 37 32
1791:C4 AB D3 4C C1 1E A0 00 14
1799:A2 18 20 BD 40 FC B6 A0 03
17A1:84 40 1E AB 20 FE 10 08 C5
17A9:8D 0F D4 AD 36 86 41 55 7B
17B1:A9 10 CC A4 27 1E 93 0A 7F
17B9:C8 1F 98 4C 1B 1F AD 92 2F
17C1:F0 34 CE 31 00 27 2A 1B 6E
17C9:A9 DC 18 6D 58 8D 2F 0E 43
17D1:A9 05 6D 80 05 8D 30 28 B2
17D9:C1 1A A9 21 02 09 20 8D B8
17E1:12 D4 A9 50 8D 32 78 20 CE
17E9:80 0F CE 37 0E D0 F8 4C 5B
17F1:ED 1E 01 72 83 D0 F9 AD E6
17F9:01 DC 29 10 F0 F9 A9 00 C8
1801:8D 15 D0 4C D3 1C AD 00 86
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⊡

Only on Disk

In addition to the type-in programs found in each issue of the magazine, we offer additional features and programs every month on the *Gazette Disk*. Check out "Gazette Gallery" for original 64 and 128 artwork and look for our bonus programs as well. These programs and their instructions appear only on disk. Here are descriptions of this month's bonus programs.

Labyrinth Adventure

Arthur Moore

You face twisting passages, hidden traps, and a pilfering foe in this two-player adventure. Two joysticks and a little greed are required.

Try to reach the staircase that leads to another dungeon in this three-level maze, but you can't escape without first collecting some wealth. You can find your own treasure, but it's more fun to steal your opponent's.

Crossword Creator

Randy Thompson

Have you ever tried to create a crossword puzzle? If you have, then you know how frustrating it can be. With *Crossword Creator* you can enter up to 100 words and have the computer do all the difficult letter-matching and layout work.

Once you have created a puzzle, you can edit it, save it, or erase it. Best of all, you can print copies and see if your friends can solve your puzzle. This one is a must for crossword fans.

How to Type In COMPUTE's Gazette Programs

Each month, Gazette publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader,* for BASIC programs, and *MLX,* for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements, as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from Gazette, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the Shift key while pressing another key), the character is underlined. For example, A means hold down the Shift key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, ⟦ ⟧, hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the Ctrl key while typing the letter in braces. For example, {A} means to press Ctrl-A.

The Quote Mode

You can move the cursor around the screen with the Crsr keys, but you may want to move it under program control, as in examples like {LEFT} and {HOME} in the listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode, which can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. Use the delete key to back up and edit the line. Type another quotation mark to get out of quote mode. If things get too confusing, exit quote mode by pressing Return; then cursor up to the mistyped line and fix it. If the mistake involves cursor movement, you must press the quote key to reenter quote mode. ◘

When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	♥
{HOME}	CLR/HOME	S
{UP}	SHIFT ↑ CRSR ↓	●
{DOWN}	↑ CRSR ↓	Q
{LEFT}	SHIFT ←CRSR→	▌
{RIGHT}	←CRSR→	]
{RVS}	CTRL 9	R
{OFF}	CTRL 0	▁
{BLK}	CTRL 1	▕
{WHT}	CTRL 2	E
{RED}	CTRL 3	£
{CYN}	CTRL 4	◥

When You Read:	Press:	See:
{PUR}	CTRL 5	▒
{GRN}	CTRL 6	↑
{BLU}	CTRL 7	←
{YEL}	CTRL 8	π
{ F1 }	f1	▔
{ F2 }	SHIFT f1	╮
{ F3 }	f3	▁
{ F4 }	SHIFT f3	╰
{ F5 }	f5	▏
{ F6 }	SHIFT f5	╯
{ F7 }	f7	▕
{ F8 }	SHIFT f7	▒

When You Read:	Press:	See:
←	←	←
↑	SHIFT ↑	π

For Commodore 64 Only

When You Read:	Press:	See:
⟦1⟧	COMMODORE 1	♣
⟦2⟧	COMMODORE 2	╭
⟦3⟧	COMMODORE 3	⊠
⟦4⟧	COMMODORE 4	◘
⟦5⟧	COMMODORE 5	┴
⟦6⟧	COMMODORE 6	▐
⟦7⟧	COMMODORE 7	◆
⟦8⟧	COMMODORE 8	▚

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- Loom
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- Night Shift

Origin
- Wing Commander
- Savage Empire
- Ultima VI
- Bad Blood

Bad Blood
ORIGIN
AdLib
SMACK
BOOM
WING COMMANDER
The 3-D Space Combat Simulator
ORIGIN
Ultima VI
The False Prophet
ORIGIN
Roberta Williams
MIXED-UP MOTHER GOOSE
FACES ...TRIS III
Spectrum HoloByte

Sierra On-Line
- King's Quest V
- Space Quest IV
- Fire Hawk: Thexder –The Second Encounter
- Mixed-Up Mother Goose
- A-10 Tank Killer
- Rise of the Dragon
- Stellar 7
- Red Baron
- Heart of China

Spectrum HoloByte
- Flight of the Intruder
- Faces...TRIS III
- Stunt Driver
- Falcon 3.0
- Avenger A-10

A-10 TANK KILLER
IBM PS/1
STUNT DRIVER
Spectrum HoloByte
INDY
Indiana Jones Last Crusade
LUCASFILM
LOOM
LUCASFILM
FLIGHT OF THE INTRUDER
Spectrum HoloByte

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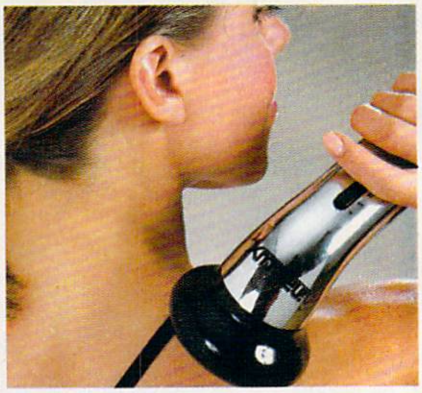

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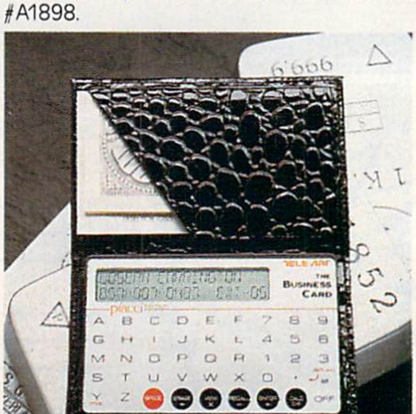

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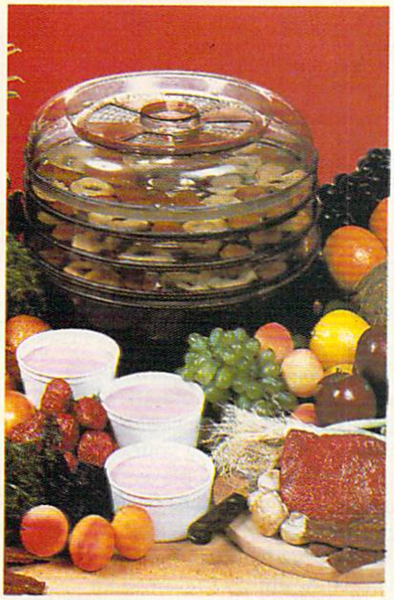

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Even if it weren't so specially low-priced, this food dehydrator would be immensely economical. Using almost none of your valuable time, it makes nutritious, preservative-free, refined-sugar-free, *healthful* dried fruits and snacks, plus yogurt — at a tiny fraction of their price in stores. Simply slice fruit into lemon juice, spread on the perforated plastic stacking trays and forget it for 12 to 24 hours. With electrical coil at bottom, the unit is engineered for convection heating; no fan needed, so it's energy-efficient and noiseless. A 28-page instruction book provides guides for adjustable vents and timing plus enticing recipes. Treat kids to crispy banana chips, make dried apples, apricots, raisins...even beef jerkey and vegetables for soups and camping trips... try zucchini slices with sesame seeds — a dieter's dream substitute for hi-cal chips. 12" dia., U.L. Listed. 5-tray Dehydrator (shown) **$51.98** ($6.25) #A1887X. 3-tray Dehydrator **$41.98** ($5.25) #A1886X.

▼ TEACH AN OLD LAMP NEW TRICKS

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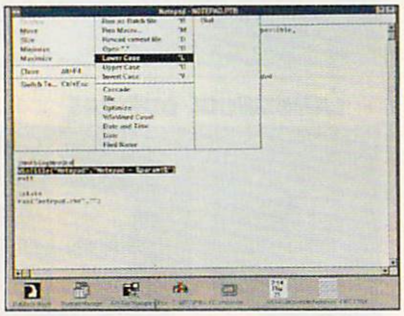
SNEAK PEEKS

BATCHWORKS SDK

Windows falls short in two areas: There's no batch language, and for system-level macros, you have to depend on the wimpy *Recorder* accessory. *BatchWorks SDK* 2.0 from Publishing Technologies not only cures the *Windows* batch-file blues, but it also has powerful features you'll be surprised to find in a program with such a reasonable price tag.



Add batch files and macros to your control menu with *BatchWorks SDK*.

BatchWorks is conceptually divided into two parts: a batch component and a macro component. There's really no difference in the way the batch and macro languages work except that you can't run a macro by double-clicking on it as you can a batch file. This saves you from accidentally launching a macro and having it send keystrokes to an application that isn't intended to receive them.

There are two ways to create batch files and macros. You can enter batch statements in an ASCII text editor (*Text*, a first-class editor, is included with *BatchWorks*), or you can record your macros as you create them and edit them later.

The *BatchWorks* language itself contains nearly 100 commands that do everything from running a program to sending keystrokes to an application. To give an example, here's a simple batch file that runs *Microsoft Excel.*

```
DirChange("c: \ ss \ excel \ xls")
Run("c: \ ss \ excel \ excel.exe","")
Call("expand.ptm","")
```

The first line changes the directory to *Excel's* XLS subdirectory, where work sheets are stored. The next line runs *Excel,* and the last line calls a *BatchWorks* macro—EXPAND.PTM—that expands the *Excel* window to an optimum size.

One especially elegant feature of *BatchWorks* is that it enables you to install batch files and macros so they appear as part of the control menu—the menu that's available from every window. Using this menu option, you could, for example, access the macro to run *Excel* from any *Windows* application.

All this is impressive, but the program's *coup de grâce* is its compiler. With the compiler, you can take your newly created batch files and compile them to stand-alone EXE programs. You can then distribute these programs, free of royalty fees, to any *Windows* user.

CLIFTON KARNES

■

Scheduled Release: June 1991
For IBM PC and compatibles—$149

PUBLISHING TECHNOLOGIES
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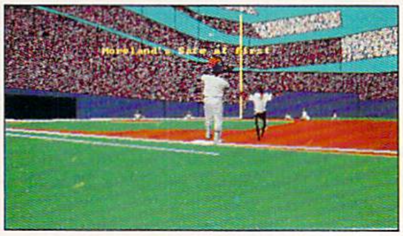
Austin, TX 78731
(512) 346-2835

EARL WEAVER BASEBALL II

A complete graphic makeover is the big news for the latest version of *Earl Weaver.* The nondescript players are replaced by larger, digitized players, making full use of the popular VGA graphics standard. The split screen is gone, replaced by a view of the field that faithfully re-creates the view of major league baseball as seen on television all summer long. You can even set TV angles to get the best view of the game from anywhere in the park.

The editing and team-building facilities have been greatly enhanced, even down to choosing the color for your fences when creating your own ballpark. The number of players you can have on your roster has been increased from 25 to 40. One of the most innovative features to be added, however, is the ability to download stats from online sources like Stats Inc. or the USA Sports Center for use in the game. That's a real boon for fantasy players who use *Earl Weaver* to run their leagues.



Several different camera angles turn this ball game into a televised event.

Smaller improvements that add up to big enhancements include better playing from the computer opponent, a bigger selection of pitches to choose from, and access to the commissioner options without having to completely exit the game. All of this means a brighter spring training for all PC baseball players. ▹

PETER SCISCO

■

Scheduled Release: May 1991
IBM PC and compatibles—$49.95

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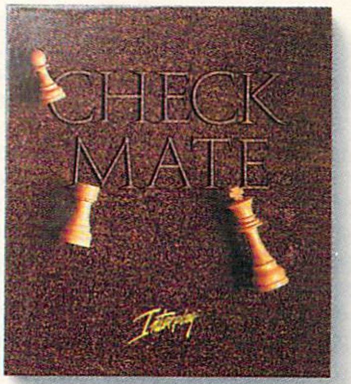
What Are Sneak Peeks?

Sneak Peeks are advance reviews of upcoming software and hardware products. Every effort is made to ensure that the information contained in these reviews is accurate at the time they are published. *COMPUTE* will review the final edition when it becomes available.

FOR THE BEST IN CHESS, MAKE THE PERFECT MOVE.



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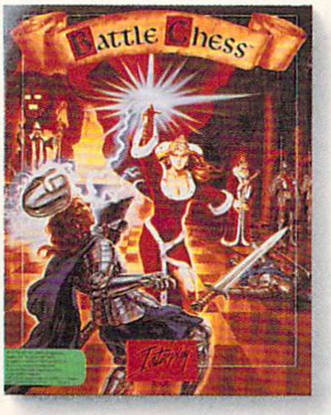

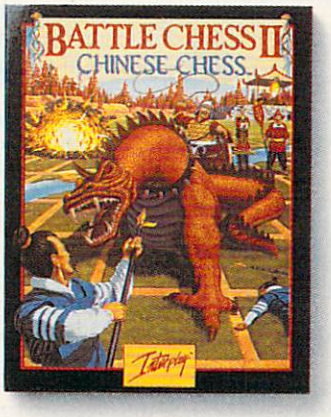

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The Royal Game of Chess will never be the same. Interplay Productions now challenges you to choose from three different chess programs, each offering its own unique blend of stunning animation, spectacular sound, and powerful algorithms designed to test your tactical and strategic thinking.

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- **Battle Chess II: Chinese Chess™** uses even more animation and sound than the original **Battle Chess™** to bring the world's most widely played version of chess to the West. *Computer Gaming World* called it *"a feast for chess lovers which will leave you wanton to play again 15 minutes after each game!"*

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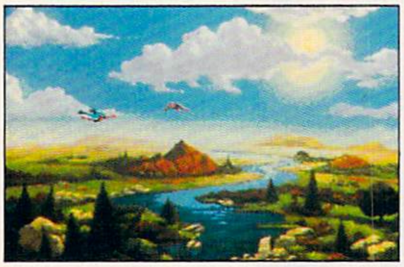
Circle Reader Service Number 117

GAMES

CHOICE

KING'S QUEST V

King Graham quests again, this time in a gaming environment far easier to navigate than before! If typing ever turned you away from adventure, you no longer have an excuse not to embrace adventure games. The splendid synergy of graphics, sound, and gameplay in *King's Quest V* makes for one of the most rewarding quests in computer history.



Sumptuous panoramas will unfold before you in *King's Quest V*.

Previously in Sierra games, you moved a character around a 3-D screen with joystick, mouse, or keyboard and typed in commands at the bottom of the screen on a text entry line. *King's Quest V* does away with typing. Instead, the game can be played entirely with a mouse. The keyboard and joysick are also active, but I found the mouse easier to use.

When you move the cursor to the top of the screen, a row of icons pops up that allows you to perform all of the game's functions. You can select the icons on the bar directly with the cursor or avoid the icon bar entirely. The second button on the joystick or mouse cycles through the icons by changing the cursor to an eye (for examining), hand (for using objects), character (for moving), head (for talking), or an inventory object (for using an object on something else). This is the way to play *King's Quest V*. Go near the icon bar only to save games, choose an object from your inventory, or control volume level and other environment variables.

After a minute spent mastering the interface, you begin the real fun. You assume the role of King Graham of Daventry, and upon returning from a walk, you realize that your castle and family are missing. With the help of Cedric the owl, you must find the castle and its occupants and defeat the evil wizard responsible for their disappearance. The journey will take you to a variety of places, from desert to ice caves, and will introduce you to many distinctive characters, such as the Queen of the Bees and the King of the Rats.

The story and miniquests of the game are woven together beautifully, and members of the animal kingdom that you save from disaster will return the favor in either the most unlikely places or your hour of need. Save the King of the Rats, and he'll later free you from jail, allowing you to continue your quest. You also have the opportunity to prevent the destruction of an ant community. As it turns out, the ants prove to be adept at finding a needle in a haystack—a task you'll have to complete in order to finish your quest.

Expect some trouble with the puzzles as a result of the game's convoluted plotting. With so much depending on what characters you've met or need to meet, problem solving may require some extremes of imagination. If I hadn't had the hint book, I might never have cleared some of the game's obstacles. You might choose to play with a few friends; someone is bound to have some insight or interesting suggestions. As a game played alone, though, *King's Quest V* might be too much of a challenge.

The strongest element of *King's Quest V* is the use of graphics. The pictures in the 256-color version of the game were painted by artists and then optically scanned for breathtaking results. For machines supporting fewer colors, the game's developers chose the standard approach to computer graphics: using paint programs to create facsimiles of the originals. The resulting art is good but not stunning.

Further enhancing your total gaming experience is the superb music in *King's Quest V*: a good reason to buy a sound board, although even those computer owners with only an internal speaker will be in for a treat.

Though a beautiful game, *King's C* is not without its sinister myste

The soundtrack is nonstop, and the theme of the music varies with the screens displayed.

My suggestion to Sierra after seeing *King's Quest V* is that it not change the interface at all and use that interface on all its adventure games. The company assures me that *Quest*'s interface will become its standard. This means, with Sierra games at least, that you will never again have to contend with a parser and a keyboard—a welcome promise indeed.

RUSS CECCOLA

■

IBM PC and compatibles; 512K RAM for EGA, 640K RAM for MCGA, VGA, or Tandy 16-color; mouse or joystick optional; supports Roland, Ad Lib, Sound Blaster, Game Blaster, and PS/1 sound cards—$69.95 for VGA version, $59.95 for others

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STORMOVIK SU-25

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Starting with the new aircraft, there are plenty of things to learn. The SU-25 is a superb ground-attack aircraft, a real bomb truck. Comfortable at low or high speed, it can deliver anything from unguided rockets to laser-guided antitank missiles. Built for low-level attacks, it will frequently take you down in the weeds at less than 50 meters.

The premise for the game is unlikely but not altogether impossible. In 1991, peace continues to spread across eastern Europe. Good news for most, but disarmament could mean curtains for some of the world's largest companies—defense contractors. To keep things stirred up, hawkish military officers on both sides of the crumbling Iron Curtain are recruited by the defense industry to use regular military units to commit terrorist acts. As a Soviet pilot assigned to fight these terrorists, you'll face some of the best equipment in the world. You may find yourself shooting down an American-made A-10 attack aircraft and dodging Soviet SAMs at the same time.

You may choose from a variety of interesting missions that are offered. They range from attacking fuel dumps and armor to escorting commercial airliners to protecting downed pilots. And even though *stormovik* literally means "ground-attack aircraft," a few air-to-air missions are also thrown in for grins. The flight characteristics used in the simulation seem pretty good, though the plane handles unusually well with a full bomb load and hard banking does not seem to result in the loss of altitude you would expect.

In command of serious firepower, pilots in *Stormovik* represent the elite.

Graphically, the view from the cockpit is well done but nothing new or exciting. Fans of *LHX Attack Chopper,* also by Electronic Arts, will find themselves on familiar ground, as the same graphic engine seems to have been used to drive *Stormovik SU-25.* Numerous exterior views of the plane are offered, as you would expect, along with zooming and time compression.

The game supports Ad Lib and CMS sound cards. The sounds produced are good but not spectacular; more could have been done in this area. The manual is also good but not great. It's a little light on tactics and not nearly as hefty as a MicroProse manual, though it is accurate and the fold-out map of the battle area is helpful.

Game designer Rick Tiberi hasn't pioneered any new ground technically, but the game subject matter and content are certainly well done and refreshing. The missions flow from one to the next in a logical manner and increase in difficulty as time goes by and your rank increases. And there is enough variety in the assignments to keep you coming back to see what's next.

Stormovik SU-25, the game, is a lot like the aircraft itself—not real flashy but solid, well constructed, and capable of doing the job. Fans of high-speed flight certainly won't be disappointed, and the idea of fighting to preserve peace adds an interesting edge to the game.

RICHARD SHEFFIELD

IBM PC and compatibles, 512K RAM for CGA, 640K RAM for MCGA or VGA; supports hard drive, supports Ad Lib and CMS sound boards, mouse and joystick optional—$49.95

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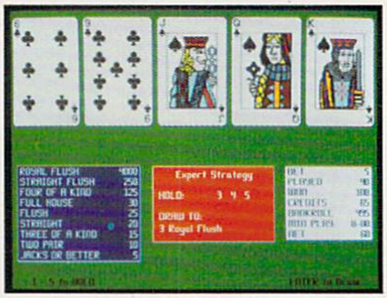
STRATEGIC VIDEO POKER

Anybody who has been to Vegas or Atlantic City is familiar with video poker machines, this generation's answer to the slots. *Strategic Video Poker* claims to teach you how to win at these machines by simulating one on your PC. Its graphics and playability are modeled closely after the real thing. An unfriendly installation procedure may cause problems for novices, but more experienced users will soon be drawing to an inside straight.



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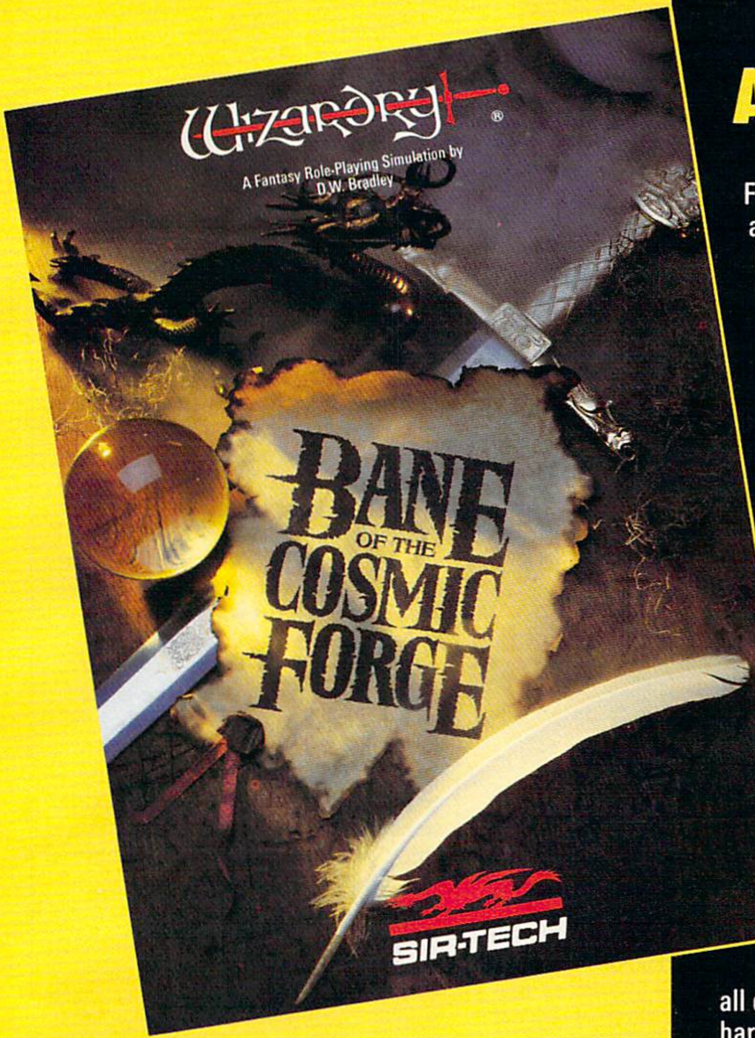
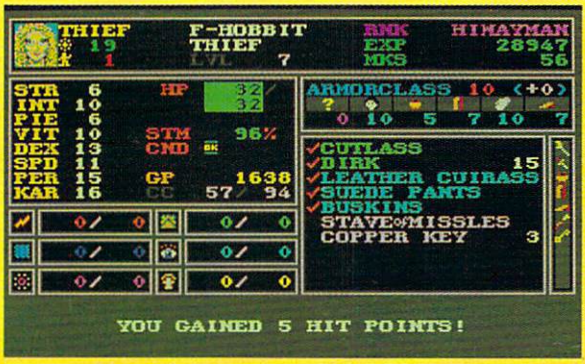
BANE OF THE COSMIC FORGE

How do you destroy a pen whose every scribble becomes instantly true? First you must find it, and in *Bane of the Cosmic Forge,* that's what you'll do—or the land will remain forever cursed.

This latest role-playing fantasy from Sir-Tech combines the old and the new, mixing familiar Wizardry story and character-generation elements with new visuals and an updated user interface. Your party of six heroes once again features a mix of alien species and talents, now enhanced by a larger pool of genetic material that includes cat, lizard, dog,





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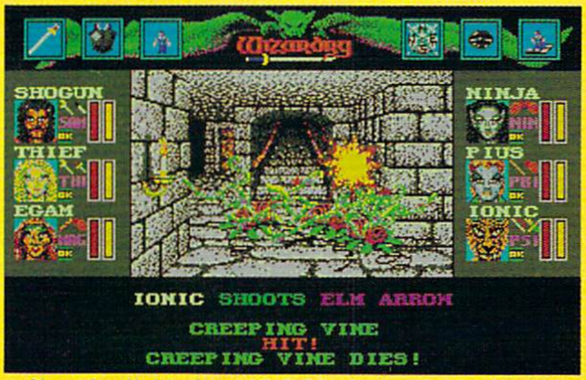
THIEF          F-HOBBIT       RNK    HIMAYMAN
 19            THIEF          EXP       28947
  1            LVL     7      MKS          56

STR  6     HP      32/       ARMORCLASS 10 (+0)
INT 10             32          ?
PIE  6                         0 10  5  7 10  7
VIT 10     STM      96%
DEX 13     CND  OK           ✓CUTLASS
SPD 11                       ✓DIRK             15
PER 15     GP     1638       ✓LEATHER CUIRASS
KAR 16     CC   57/  94      ✓SUEDE PANTS
                             ✓BUSKINS
    0/     0        0/     0  STAVE of MISSLES
    0/     0        0/     0  COPPER KEY        3
    0/     0        0/     0

          YOU GAINED 5 HIT POINTS!
```

Actual Screens from MS-DOS Version



```
IONIC SHOOTS ELM ARROW

CREEPING VINE
HIT!
CREEPING VINE DIES!
```

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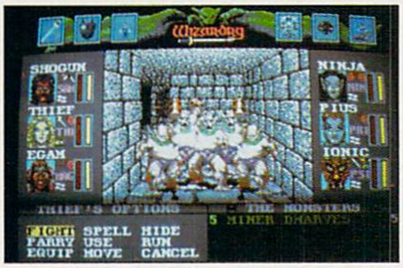
and dragon races, as well as the usual dwarves, elves, hobbits, and human vagrants. Each character has a colorful screen of information displaying a portrait, health, gold, carrying capacity, skill levels, items in knapsack, and weapons/armor in use. Good news: You no longer have to type in a five- or six-letter spell-casting abbreviation that resembles *XyWrite*'s mnemonic commands. Each spell's full name and point cost are displayed during battle.



Miner dwarves aren't exactly happy to see you in *Bane of the Cosmic Forge*.

The old wire-frame, two-color Wizardry caves are gone, replaced by handsome stone corridors with animated, flickering torches. A few deft touches are impressive, such as the sculpted fountains, locked alcoves, and treasure caches. The game's developers didn't take these far enough, however, since the same walls and objects serve for all interiors, regardless of appropriateness. I found only one deviation: complete darkness, which the game substitutes whenever the accompanying text describes outdoor environments.

Monster encounters are animated. Individual groups approach or retreat, their members in turn striking different poses and wielding impressive weaponry. Though none of this is functional in any arcade sense—you can't aim a projectile at a momentarily parrying bushwhacker—it does enhance the overall gaming reality. Watching monsters vanish one by one as your spells, swords, and missiles take effect makes personal satisfaction a reward in your crusade against evil.

Saving games in progress is no longer limited to the Inn, nor would that be convenient, given the increased size and scope of this adventure. *Bane* resembles past Wizardry products in other respects, though. Finding hidden passages and completing arcane puzzles are of prime importance, and I found the accompanying notes excellent. Overall, *Bane of the Cosmic Forge* is an attractive addition to the computerized role-playing fantasy scene.

BARRY BRENESAL

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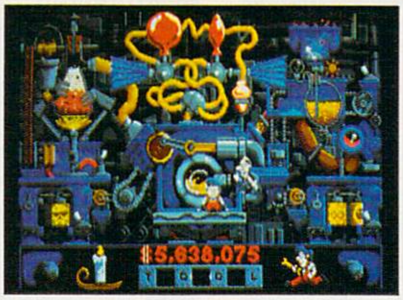
NIGHT SHIFT

Remember the old ladder games? I do. I spent hours with *Loderunner* and *Donkey Kong,* jostling little 8-bit, 3-MHz heroes from one screen to the next. But that was yesterday. Today's ladder-oriented diversion runs at 8 MHz, has more bits than you can shake a joystick at, and supports VGA. The name of this dazzling diversion? *Night Shift,* from LucasFilm Games.



BEAST doesn't make your job any easier with its frequent breakdowns, but in *Night Shift*, that's just part of the fun.

Night Shift brings the twenty-first century to confirmed ladder leapers like me with its simple premise. You're F. Fixit, employee of Industrial Might and Logic, and you work the night shift in neoenvironmentalist Glenn T. Bingham's toy factory. Specifically, you operate Bingham's Environmentally Active Solution for Toys (BEAST), a ladder-laden toy generator fashioned from recycled bicycle wheels, trash cans, and broken chairs. The product: a line of dolls with names like Baby Vader and C1.5PO. Production is the object of this game, and you and BEAST are turning 'em out as fast as you can. Alas, there is a problem. BEAST keeps breaking down. To keep it running, you must climb ladders, flip switches, tighten bolts, light burners, pedal bicycles, dodge lawyers, vacuum up lemmings, and so on. The action is accompanied by Ad Lib, Tandy, or Sound Blaster sound. Even standard, tinny PC speaker sound isn't bad. There's first-class animation and genuinely appealing screen art, plus your choice of keyboard or joystick control. It's good!

Could it be great? A save-game option would be appreciated, and the easily misplaced copy-protection wheel could be done away with altogether. But those complaints notwithstanding, *Night Shift* is one you'll enjoy. Just don't play it so late that you miss the day shift!

STEVE HUDSON

IBM PC and compatibles; 512K for EGA or VGA, 640K for MCGA or Tandy 16-color; joystick and hard drive recommended; supports Ad Lib and Sound Blaster sound cards—$39.95

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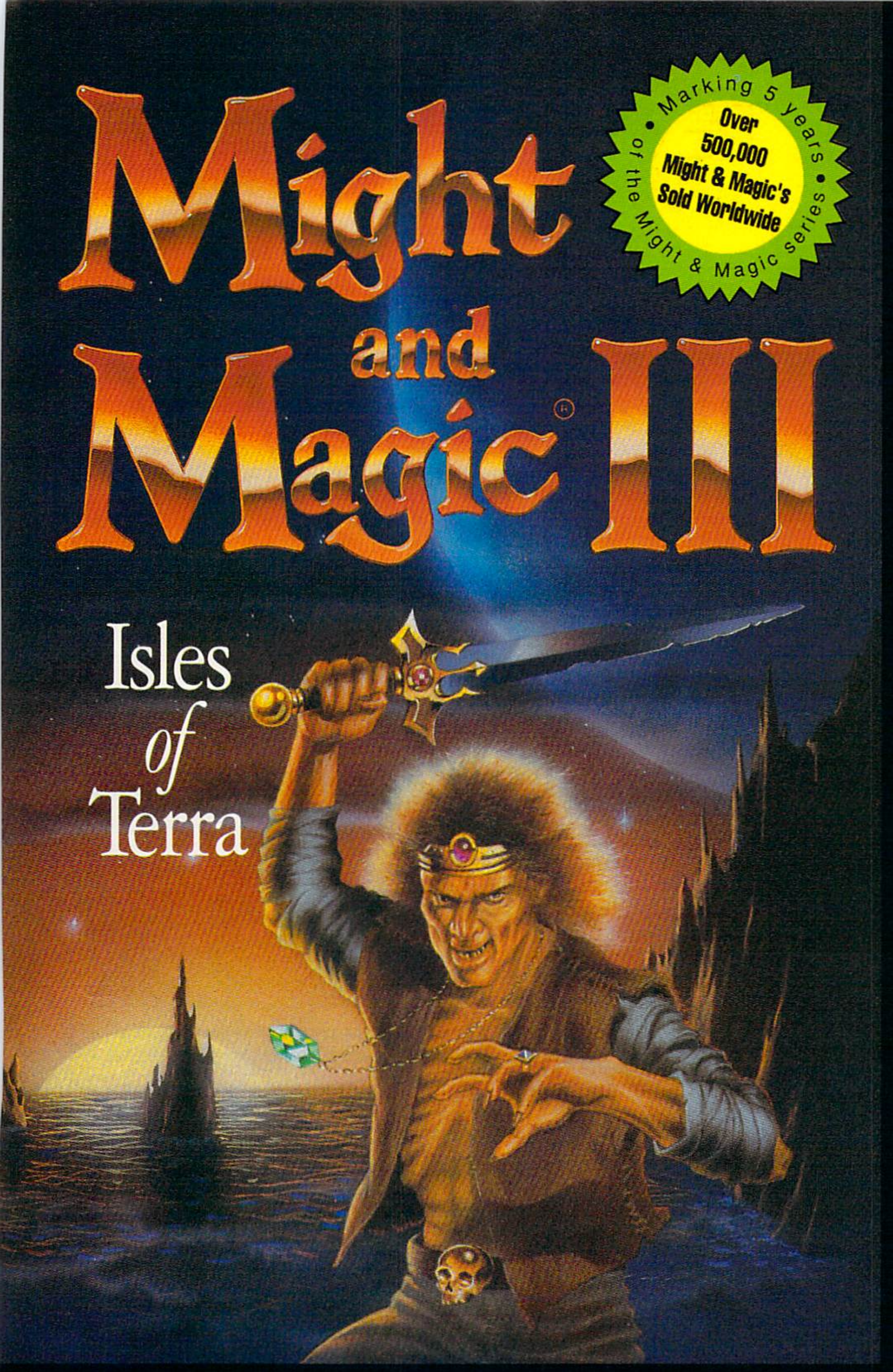
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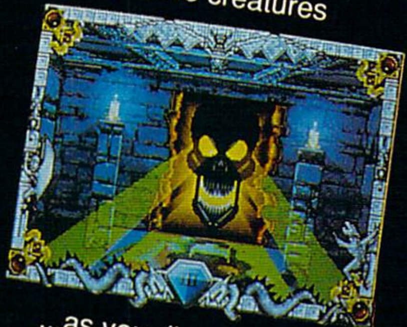

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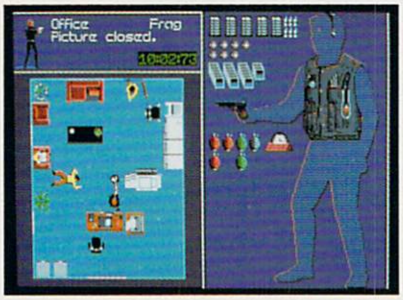
Circle Reader Service Number 153

to your efforts.

Four espionage activities form the core of your investigation: wiretapping, code breaking, car chases, and break-ins. All present sophisticated challenges.

Code breaking is safe but difficult. Wiretapping requires following the electrical flow of some fairly complex telephone lines; substitute the wrong microchip, and alarms sound. Car chases involve caging a suspect between two vehicles you control on a large city map grid. Choose faster automobiles, and their sporty designs may alert your quarry too soon; inconspicuous cars may be too slow to overtake opponents.



Terrorist strongholds provide the backdrop for espionage in *Covert Action.*

Break-ins are the heart of *Covert Action.* You have limited carrying capacity and must choose your weapons and burglary devices carefully. Overhead perspective and realistic floor plans (with sofas, stereos, and wall safes) provide the backdrop as you move Max or Maxine from room to room. Meanwhile, of course, terrorist organization guards are afoot. If you trigger an alarm, they'll meticulously search every inch of the building. During a break-in you may uncover valuable evidence or even make an arrest, but being caught in a hail of bullets costs you valuable recovery time.

Covert Action offers four levels of difficulty, and each adds fresh twists to already complex cases. When you jump from local to national assignments, goon squads go on alert and gun for you, rather than waiting in their headquarters for your visits. At the regional level, coded messages sometimes arrive with no spaces between words. Wiretapping circuitry includes blank microchips, leaving you to infer their design.

Some configurability has been built into *Covert Action,* allowing you to stress those gaming elements you prefer. Your character receives credit for four training sessions at the start of his or her epic adventure. Apply these sessions to the espionage activities of your choice, and the resulting changes simplify certain tasks. Training for code breaking and wiretapping, for instance, would certainly make those tasks easier, especially at higher levels of difficulty where problems really begin. Combine these options for customization with the mean, quick arcade-and-tactics play of break-ins, and *Covert Action* stands as a well-balanced game, even though the opposition may seem overwhelming.

As broadly realistic as *Covert Action* is, I wince at its stereotypes. The terrorist organizations are almost entirely Middle Eastern and South American, and nearly all operatives in every organization are Arab and Hispanic. Given that programming is a conscious (some programmers I know would say superconscious) activity, these ethnic choices were probably planned. As such, they are both offensive and inaccurate. That aside, *Covert Action* is a challenging, well-designed, attractive game with a nearly endless variety of crimes to solve and criminals to round up. Your ultimate goal is to catch all 26 masterminds, and you'll need at least 52 cases to accomplish it. Take some friendly advice: Purchase *Covert Action* at once, so you can get an early start on your clandestine activities.

BARRY BRENESAL

IBM PC and compatibles; 512K RAM for CGA, EGA, or Tandy 16-color, 640K RAM for VGA; supports Roland and Ad Lib sound cards; joystick optional—$59.95

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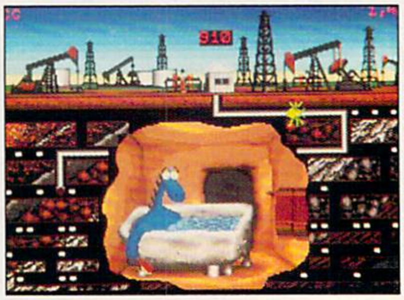
OIL'S WELL

Not every game from 1982 warrants recycling, but the addictive *Oil's Well* is worth a second look. Originally released for 8-bit cartridge computers, the game is now fully redesigned to take advantage of high-resolution VGA graphics and sound cards. But even if your computer is a standard system limited to CGA graphics and ordinary internal speaker sounds, *Oil's Well* promises hours of amusement.

The object of the game is to maneuver an oil-drill bit deep beneath the earth's surface, guzzling every drop of crude you encounter along the way. The more oil devoured before time runs out, the higher your total score. You earn extra points when you gobble oil goblets and avoid the destructive little beasties that delight in demolishing your oil-drilling equipment. Steer clear of land mines, or your bit will bite the dust and gobble goo no more. Be prepared to wage several battles against unrelenting environmental opposition before you navigate an entire screen.



Slater the petrosaur seems surprised to see you in his bathroom in *Oil's Well.*

Since you begin each game with only three drill bits and your first replacement is 10,000 points away, each bit is precious. Ingest all the oil pellets onscreen, and you advance to the next maze of obstacles. But don't give up! *Oil's Well* only ends well if you meet Slater, an animated petrosaur who lives beneath the oil fields.

Oil's Well is perfect for when you want mindless arcadelike challenges; despite drilling deep, there's no depth of play. Nevertheless, *Oil's Well* delivers good fun. ▹

CAROL HOLZBERG

IBM PC and compatibles; 512K RAM for CGA, EGA, or Hercules, 640K RAM for MCGA, VGA, or Tandy 16-color; hard disk recommended; mouse or joystick optional; supports Roland MT-32, Ad Lib, Game Blaster, Sound Blaster, and other music boards—$34.95

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Circle Reader Service Number 199

MICROLEAGUE FOOTBALL: THE COACH'S CHALLENGE

The title says it all: This game simulates the decisions and strategies that go into coaching a professional football team and presents them in animated fashion on your PC. For all of you Monday morning quarterbacks who think you could have pulled Sunday's game out of the fire, this game is a ticket to fantasyland.

The main package includes 20 great NFL (and AFL—remember those?) teams of the past. Choose two and get ready to write history. Coach Bart Starr's Packers of 1966 against the undefeated 1972 Dolphins; run Broadway Joe's 1968 New York Jets against the awesome Chicago club of 1985. Any way you slice it, there's plenty of action.

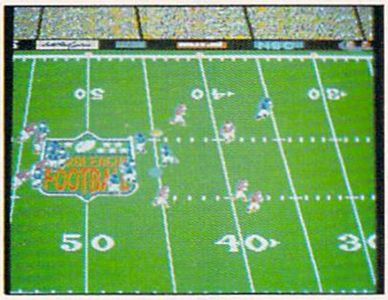
MicroLeague Football is pure strategy—no arcade action or joystick finesse required. After choosing your teams, you and your opponent (either the computer or another person) make all of the defensive and offensive calls. If you get stuck, you can ask the computer to make the decision for you, but that takes away from the fun of it.

Play in either Normal or Expert mode. The Normal mode provides a diagram of formations and plays which you can choose during the game. In Expert mode, you call the plays strictly by number, with the aid of a card listing offensive and defensive plays (22 separate offensive plays, not including kicks; seven defensive postures, with multiple blitz patterns and double-team calls).

Input for calling plays is at first difficult but becomes easier with practice. A more consistent interface would make the game easier to learn. Start out in Normal mode; then, after a few games, move up to the Expert level. Also, it's difficult to decide whether or not to accept a penalty because the results of disputed plays aren't immediately clear. You may give up a 15-yard rushing gain for a 10-yard penalty gain if you don't pay strict attention to the animation.

Although not as complex as some other computer football simulations, *MicroLeague Football* succeeds in capturing the feel of a real pigskin contest. The animated players, which represent real athletes, react fairly predictably within the parameters of their statistical abilities. That makes the strategy of play calling all the more important.

A few added features would've boosted this game's realism quotient. A 30-second clock would have added tension to the battle between the hash marks. Instead, time ticks away according to some inscrutable system clock, which makes it difficult to know when to call those last precious timeouts.



***MicroLeague Football* stresses strategy, but you won't miss any of the action.**

To its credit, the game does account for weather conditions (you set these at the beginning of the game), injuries (the game produces these at random), and penalties (also random). These variables make player performances less predictable and put a more human face on the game.

MicroLeague Football supports CGA and EGA graphics, but even on a 16-color monitor there isn't much detail. You can follow the players on the screen, but the uniforms are either blue or cyan—no hometown colors for your favorite team. Your viewpoint is from the side of the field looking down. You can see about 30 yards of the field at any one time—the screen scrolls horizontally as players move down the field on a run or pass play.

Sound is limited to the internal PC speaker and consists of beeps and whistles. You can turn off the sound by pressing the Alt and S keys simultaneously (undocumented).

The depth of this game reveals itself when you create your own league. Creating a league is incredibly simple. Initialize a league by giving it a name; then decide on the number of conferences you want in your league (one, two, or six) and assign teams to the league. On the main program you can choose from among the 20 included teams; other teams are available for your league on franchise disks you purchase separately.

Playing in a league lets you build statistical records over the history of a season. The game's Quick Play option is ideal for compiling stats. It's possible, for example, to play a complete four-game season with 18 teams in six conferences, with a best-of-five conference championship series and best-of-seven world championship series, in 15 minutes. Think of it as your own personal Super Bowl.

Straightforward, basic, well-designed, and fun—*MicroLeague Football* presents the strategic side of the computer gridiron. Its simplicity fosters an addictive urge to switch the computer on during spare moments to watch how you would fare against some of the best teams to ever play the game.

PETER SCISCO

IBM PC and compatibles; 512K RAM; CGA, EGA, or VGA; supports hard drive; mouse optional—$39.95
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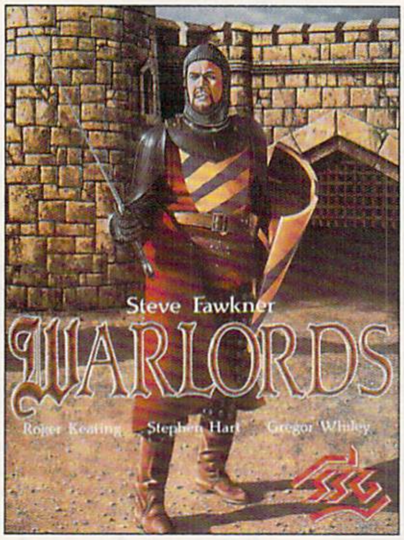

In *Warlords*, your heroes seek artifacts that give you a military edge.

production, and cost factors differing in each of 80 individually rated cities. While you're building armies, your heroes search for strength-enhancing artifacts, powerful allies, and treasure for defense works.

Warlords' computer-driven opponents perform on any of four levels you preset, and they do well (murderously so, on the Warlord level). Line drawings and VGA/EGA images are extremely attractive. The menu interface, rather cumbersome at first, becomes less so after one highly addictive game.

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INFOSPOTTER

Do you treat your computer like any piece of office equipment, flipping it on in the morning and off when you head for home? Or do you regard your PC as a powerful tool that can always be tuned for a little more speed, a little more power? If you consider yourself a power user, a program like Merrill & Bryan's *InfoSpotter* takes the guesswork out of souping up your system. It's a utility lover's utility.

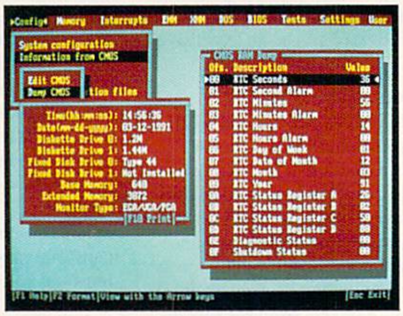
InfoSpotter provides a multifaceted view of your system. You get information about system configuration, diagnostics, detailed memory maps, IRQ tables, disk and serial port tests, and various utilities including a file locator and a global file delete function.

The program, which can run either as a stand-alone or memory-resident utility, features a menu bar across the top with choices including Config, Memory, Interrupts, EMM, XMM, DOS, BIOS, Tests, Settings, and User. From each of these, a drop-down menu offers several choices.

In short, it's hard to imagine what *InfoSpotter* doesn't offer. The program has value for every level of user. *InfoSpotter* proved indispensable recently for installing network hardware and software on several systems. During that installation, *InfoSpotter* helped resolve several conflicts that occurred involving IRQ settings, port addresses, and interrupts, generally lowering my level of anxiety.

The Config menu provides options to display a screenful of information about your system and what's installed, including memory, drives, devices, and ports. *InfoSpotter* also examines your system startup files and will make suggestions for modifying CONFIG.SYS if such changes would improve performance. *InfoSpotter* also includes a utility for modifying CONFIG.SYS and AUTOEXEC.BAT files.

The program provides a great deal of information regarding memory deployment—a big help in successfully blending conventional, extended, and expanded memories. Being able to "see" the results of experimentation with memory managers makes obtaining the desired results faster and less agonizing.



```
      Time(hh:mm:ss): 14:56:36
    Date(mm-dd-yyyy): 03-12-1991
    Diskette Drive 0: 1.2M
    Diskette Drive 1: 1.44M
  Fixed Disk Drive 0: Type 44
  Fixed Disk Drive 1: Not Installed
         Base Memory:   640
     Extended Memory:  3072
        Monitor Type: EGA/VGA/PGA
```

```
CMOS RAM Dump
Ofs. Description               Value
00   RTC Seconds                  36
01   RTC Second Alarm             00
02   RTC Minutes                  56
03   RTC Minutes Alarm            00
04   RTC Hours                    14
05   RTC Hours Alarm              00
06   RTC Day of Week              01
07   RTC Date of Month            12
08   RTC Month                    03
09   RTC Year                     91
0A   RTC Status Register A        26
0B   RTC Status Register B        02
0C   RTC Status Register C        50
0D   RTC Status Register D        80
0E   Diagnostic Status            00
0F   Shutdown Status              00
```

Defuse potential problems and explore every cranny of your PC with *InfoSpotter.*

On a more advanced level, *InfoSpotter* offers tools for a wide range of exploration. Disk and memory dumps are available; boot, partition, and BIOS tables can be examined; and interrupt usage can be monitored. Programmers will be able to see how their software affects the system and can use *InfoSpotter's* Templates feature to display easy-to-read memory dumps of the data structures their programs have created. ▹

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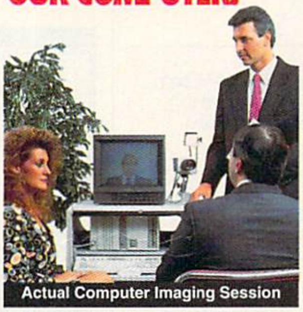

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InfoSpotter is easy to use and supports a mouse, as well as the keyboard. The program provides context-sensitive, online help as well as a complete help index, creating a friendly environment for less technically inclined users. In fact, the program's documentation encourages the use of *InfoSpotter* as a tool for learning about computers.

No PC environment should be without some system analysis software. *InfoSpotter* is one of the most extensive programs of this type available, and its versatility and ease of use make it worth considering for any software library. After all, why pass up an opportunity to get everything possible out of your system?

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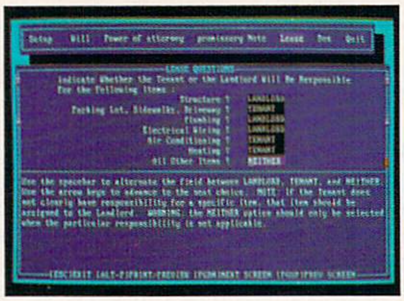
IT'S LEGAL

Like death and taxes, legal documents are unavoidable. You must deal with them to conduct your affairs in an orderly fashion. *It's Legal* offers you a quick, easy way to prepare legally binding documents yourself, without the expense of attorney's fees.

The program is entirely menu driven, has screens which are very easy to follow, and supports a mouse. Menus are offered for the preparation of simple wills, living wills, general and special powers of attorney, revocations of powers of attorney, certificates of temporary guardianship, promissory notes, and residential and commercial leases.

Sure, you can do the same thing with forms you can buy at the stationery store, but those forms rarely offer you the opportunity to create a document tailored to your individual needs. In each of its documents, *It's Legal* offers you the choice of including or excluding those provisions which are optional without damaging the legality of the document. On the other side of the coin, the program warns you if you attempt to omit any field which is essential for your document to be complete.

I was impressed by the ease of installation and use of the program, its speed of execution, and the clarity of the language of the documents which it produces. It supports a variety of printers and produces trim, pleasing documents. The manual is a model of simplicity and clarity.



Indicate Whether the Tenant or the Landlord Will Be Responsible For the Following Items :

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Parking Lot, Sidewalks, Driveway ? TENANT
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Heating ? TENANT
All Other Items ? NEITHER

Use the spacebar to alternate the field between LANDLORD, TENANT, and NEITHER. Use the arrow keys to advance to the next choice. NOTE: If the Tenant does not clearly have responsibility for a specific item, that item should be assigned to the Landlord. WARNING: the NEITHER option should only be selected when the particular responsibility is not applicable.

Prepare personal legal documents for most occasions with *It's Legal*.

Modestly priced, *It's Legal* is a worthy addition to your library. It may lead you to prepare some documents, such as those for temporary guardianship of children, which might not have otherwise occurred to you.

CHARLES IDOL

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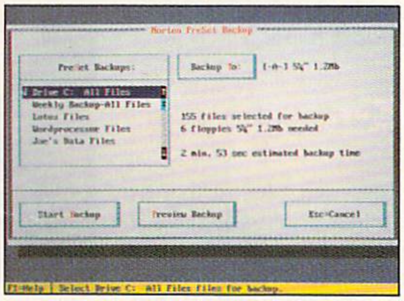
THE NORTON BACKUP AND THE NORTON EDITOR

The Peter Norton name represents a growing force in the PC utility program world. First there was *The Norton Utilities,* a best-selling package of lifesaving disk and file tools. Now Symantec, which owns Peter Norton Computing, has released new versions of two other benchmark Norton creations: *The Norton Backup* and *The Norton Editor.*

Everybody knows that backing up your hard disk is the first commandment of serious computing. But no matter how many times you hear this, chances are you don't back up as often as you should—and that's courting disaster. *The Norton Backup,* a network-oriented backup program that also works for users of standalone PCs, tries to make backing up as easy as possible so that you won't procrastinate.

Network users can take advantage of *The Norton Backup's* ability to automatically back up hard drives using multiple DOS devices as targets, including partitions, tape drives, and disk servers. Just enter the backup parameters, hit the Enter key, and head for home. Advanced features for setting the level of data verification, routing backups to more than one device, setting archive flags, and backup-schedule prompting are only a few of the options provided. However, most home users must back up their hard disks to floppies, which has to be one of the most boring tasks in the world. *The Norton Backup* does everything possible to make backing up to floppies quick and painless.



[-A-] 5¼" 1.2Mb

155 files selected for backup
6 floppies 5¼" 1.2Mb needed

2 min, 53 sec estimated backup time

F1=Help | Select Drive C: All Files files for backup.

For text editing and disk management, *The Norton Editor* and *The Norton Backup* make a lean, mean, formidable team.

The program interface is simple and uncluttered. Once you've installed the program, you can select one of five backup types, from a full backup of the entire disk to various partial backup schemes that copy only those files that are new or have been changed since the last backup. The usual procedure is to make a full backup right away and to make only partial backups thereafter, in order to save time and effort. ▹

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The disk is designed to work with Accolade's *Mean 18*. The *Mean 18* program is sold separately.

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The Norton Backup also uses more efficient data compression schemes than does the DOS backup command, saving even more time and floppies. (Though I found that a high level of data compression slows backup and restoration times for individual disks, your reward is using fewer disks overall.)

The DOS backup command requires that you format floppies before backing up to them, but *The Norton Backup* formats them for you. It even rejects bad floppies without aborting the backup sequence; not every backup program on the market will do that. (Having been through the aggravation of nearly completing a forty-floppy backup and then having to do it all over again because the last floppy developed a bad sector, I'd buy *The Norton Backup* for this feature alone.)

The Norton Backup is a solid program with no bugs that I could find (I didn't test it on a large network). The only feature I wished for was a timed backup, so backups could be set to occur automatically at a specific time each day (say, 5:01 p.m.). The manual is a model of clarity, but it needs a more comprehensive index.

The Norton Editor is a lean, mean ASCII text editor geared primarily toward programmers. Though *The Norton Editor* does have such basics as word-wrap, block markers (for copying, moving, and deleting blocks), and rudimentary paragraph formatting, you wouldn't want it as your primary word processor. But if you write your own Pascal, C, or BASIC programs, it can save you time and effort with several useful features. Autoindenting keeps your code orderly, while an outlining feature displays only lines that begin with a number or letter in the leftmost column. A matching brackets feature finds missing brackets within a line. Along the bottom of the screen is an info bar that gives a running account of RAM use, file size, number of lines, and program settings. Using a hot-key scheme, you can pop out to DOS at any time to run another program and then return to the editor by just pressing Enter. Two files can be viewed at the same time—useful when you want to compare two versions of program code. There's also mouse support including *Windows*-like menus and dialog boxes.

Probably the biggest advantage of *The Norton Editor* is its small size and parsimonious use of memory. You can run it in 130K of RAM—you can't do that with any of the leading word processors on the market and still edit files of any size. *The Norton Classic Editor*, an earlier version of the program included with the package, can run in as little as 50K. This is the editor for programmers with older machines or those who want an editor that doesn't steal RAM from big code files. The only serious problem I found with either program is the lack of a usable Undo command.

The Norton Backup and *The Norton Editor* uphold the Norton tradition of usefulness, simplicity, and value. Put both on your shopping list if you're in the market for utilities.

STEVEN ANZOVIN

■

The Norton Backup: IBM PC and compatibles, 512K RAM, hard disk; supports mouse—$149

The Norton Editor: IBM PC and compatibles, 130K RAM; supports mouse—$99

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SAMNA WORD IV

This is the first upgrade to Samna's full-featured, character-based word-processing line since the debut of its popular *Amí* and *Amí Professional* for *Windows*. Modifications in this 3.0 release add some improved features to an already noteworthy product.

The most significant changes involve increased support for laser printers. *Samna Word IV* now allows you to install as many fonts as disk space permits, instead of the 30 maximum allowed in previous product versions. Compugraphic's *Intellifont* has been added to improve font images on screen. Margin setting for proportional printing has also been simplified to adjust automatically when type style or size is altered.

WordBase Manager, a text-search utility, is an import from the recently discontinued *Samna Word Plus IV*. Like *TextWare* (and the first of its kind, Unix's *GREP*), *WordBase* indexes your documents for quick retrieval later, as opposed to *PC-Browse* or *Vq*, which perform full text searches every time they are invoked. It's an unusual feature, not often found in word processors, and potentially very useful. Academics can build book and chapter indices with it. Researchers can swiftly locate and compile data from a large number of sources. Corporations have been using similar applications lately to build hypertext presentations for staff, sales, and management.

Samna Word IV's other features aren't new, but they remain distinctive enough to warrant comment. The thesaurus, for instance, provides not only synonyms, but antonyms as well. Access to 12 different foreign language keyboards (including a Greek/math set for engineers) is easy. A document-description page tracks usage within the word processor, including edit and creation time, revision dates, numbers of pages, and edits and keystrokes. There's also revision marking, which saves both deletions and additions you've made while editing. Your document can be viewed and printed in its final form, pre-edited form, or with changes only.

Not included is *Samna Word Plus IV*'s integrated spreadsheet. It was a good one but lacked some of the high-end, memory-intensive financial operations only possible in pre-80386 days through stand-alone spreadsheets. Though currently offered to *Samna Word IV* users as a separate module, it now suffers in comparison to larger, integrated programs that also include a database and programming language, like Informix's *Smartware II*. More regrettable are *Samna Word IV*'s file-exchange utilities, which have not been upgraded from previous releases. The exchanger imports only ASCII files and balks at any high-bit characters or changes to margin settings.

Graphics conversions were always handled better than text in *Samna Word* releases, embracing TIFF (.TIF), *Lotus 1-2-3* (.PIC), and *PC Paintbrush* (.PCX) formats. Lotus announced after its recent merger with Samna that this release is intended to show loyalty to the product's character-based constituency, but there's such a thing as maintaining tradition too long. *Samna Word IV*'s menu interface is an example. Two

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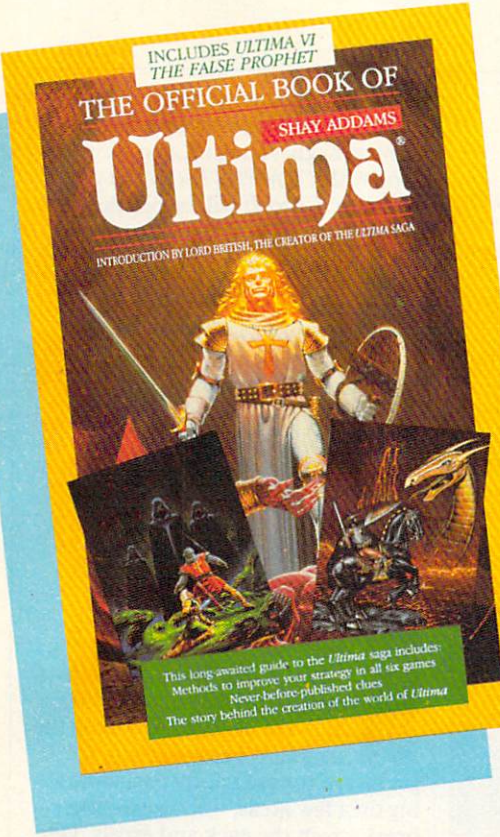
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years ago when I looked at *Samna Word Plus IV,* a thorough revision of the interface was in the works, yet it never saw the light of day. Whatever the reason, *Samna Word IV*'s menu structure is both attractive (each option on its own line in capital letters) and unintuitive. Consider the command allocated to F9, :DO, short for *do a standard editing function.* But it won't DO paragraph indentation; that's another function key. And it won't enhance text with underlining or boldface; that's yet another key. But F9 will do graphics, ASCII/*Samna Word* format interchanges, Page Preview, and searches. The logic there, if any, is arbitrary.

Some commands, in addition, have bent out of shape to accommodate first letter menu choices. Format doesn't realign paragraphs; it sets form parameters such as margins and headers. *Samna Word IV*'s Repage is closer to a more standard Format command, changing document structure to fit formatting parameters.

Samna Word IV's documentation is good, fortunately, and comes with excellent online tutorial files. It also includes removable cards for XT- and AT-style keyboards that list many *Word IV* commands and their keys.

Is *Samna Word IV* 3.0 competitive in the current character-based word-processing market? Registered *Word IV* users will find the upgraded features almost compulsory at $49.95. It's otherwise priced competitively with *WordStar* and *WordPerfect,* though it lacks the intuitive keyboard handling of the former and the conversion utilities of the latter. It does have some fine and unusual features that aren't standard among word processors. *Samna Word IV*'s learning curve is steep, but the view from the top is excellent.

BARRY BRENESAL

IBM PC and compatibles, 512K RAM (Page Preview function requires 640K), CGA, EGA, VGA, Hercules, or AT & T display adapter—$595.00
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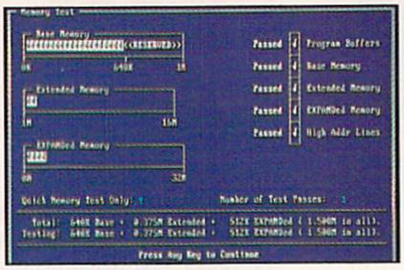
CHECKIT

Six months' work on *COMPUTE's BenchMark Program* for our hardware test lab section made me a veteran of hardware diagnostics and benchmark tests. When I got *CheckIt,* I was prepared to be highly critical of anything that fell short of my expectations. Thankfully, *CheckIt* fell easily into the category of well done. This software should be in the library of anybody who needs quick, accurate, and comprehensive system information for IBM PCs and compatibles.



```
Memory Test
Base Memory                                   Passed  Program Buffers
                                              Passed  Base Memory
Extended Memory                               Passed  Extended Memory
                                              Passed  EXPANDed Memory
                                              Passed  High Addr Lines
EXPANDed Memory

Quick Memory Test Only:            Number of Test Passes:
  Total:  640K Base + 0.375M Extended +  512K EXPANDed ( 1.500M in all).
Testing:  640K Base + 0.375M Extended +  512K EXPANDed ( 1.500M in all).
                        Press Any Key to Continue
```

Inspect your computer system without leaving your chair using *CheckIt.*

In maintaining collections of diverse hardware in company systems, correct identification of components is very important. *CheckIt* does this well and displays or prints easy-to-understand reports. But don't worry if you're new to computers. Getting the information is as easy as running the program and using the pull-down menus to view the system information.

Effortlessly getting system information doesn't mean techies won't find *CheckIt* useful. On the contrary—practically every nook and cranny of a system is explored when you ask for all tests to be performed. Hard and floppy drive performance, serial and parallel ports, memory, video, and mice are just a few examples of what you can test. A list of device drivers, interrupts, and IRQs will help you track down those notorious TSR conflicts.

CheckIt will give you the edge you need to keep equipment humming. It will identify most of the problems you run into, and by knowing what's wrong (or getting ready to go wrong), you can take evasive action before your system gives you real trouble. I can't recommend this program strongly enough. Long after I'm done with *COMPUTE's BenchMark Program, CheckIt* will be beside it on my shelf.

RICHARD LEINECKER

IBM PC and compatibles, 384K RAM—$149

TOUCHSTONE SOFTWARE
2130 Main St., Ste. 250
Huntington Beach, CA 92648
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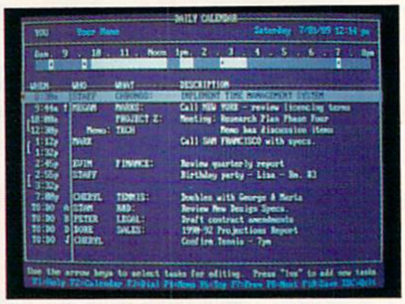
(714) 969-7746 (in California)

WHO-WHAT-WHEN

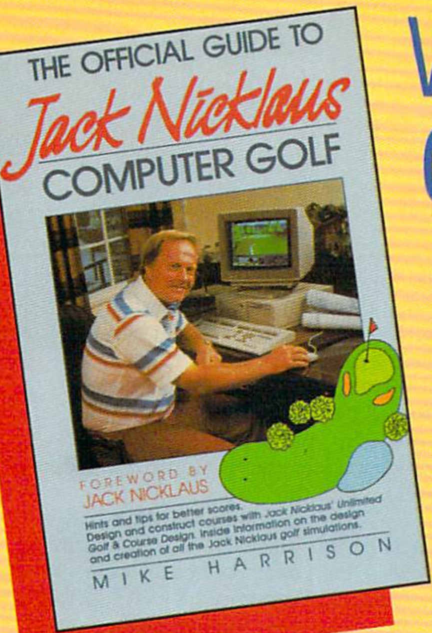
With so many Personal Information Management (PIM) software packages flooding the market, it's easy for some to get lost in the crowd. By concentrating on a few areas, *who–what–when* breaks from the pack and excels. Designed as a people organizer, a project manager, and a time-management tool, *who–what–when* has the ability to view a project and the people involved from a number of different perspectives.



Coordinate schedules and keep your projects on track with *who–what–when.*

The *who* facet presents a "people" view that cross-references people and projects, so that any person can be cross-referenced with any other person or project to display all their common tasks. Another component of the *who* module is a card file that stores basic information about people along with a telephone list.

The *what* module displays pro-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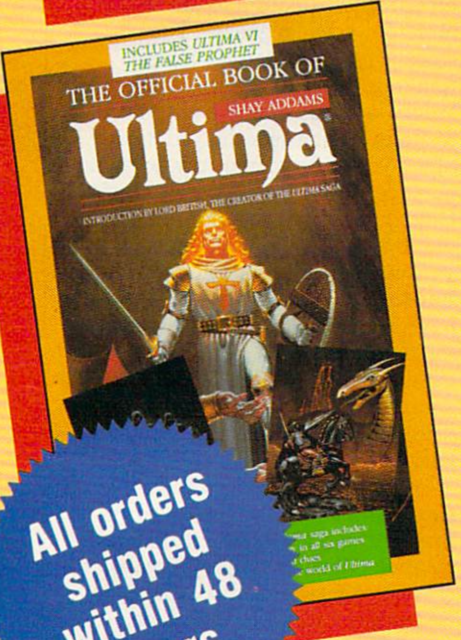
MIKE HARRISON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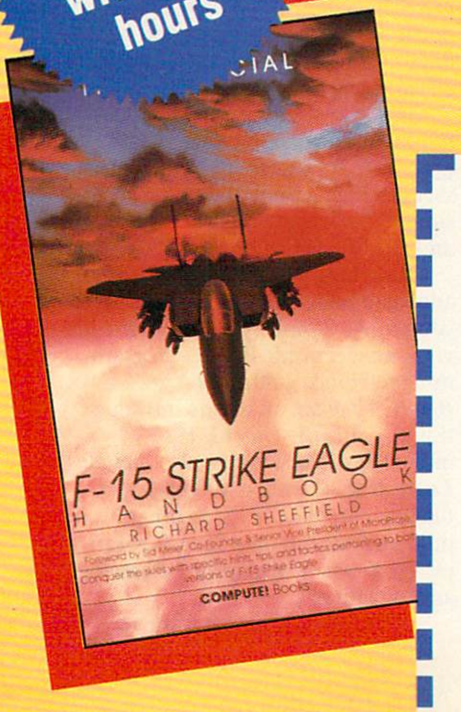
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RICHARD SHEFFIELD
Foreword by Sid Meier, Co-founder & Senior Vice President of MicroProse
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COMPUTE! Books

WHETHER IT'S GOLF, AIR COMBAT, OR ADVENTURE COMPUTE HAS THE OFFICIAL GUIDE

The Official Guide to Jack Nicklaus Computer Golf

by Mike Harrison
Foreword by Jack Nicklaus
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Here's the inside story. Learn how professional course designers decide where to put bunkers, trees, and greens. Also includes tips for all the Jack Nicklaus golf games, including *Jack Nicklaus' Unlimited Golf & Course Design.* This is the only authorized guide to all the Jack Nicklaus computer simulations from Accolade.

The Official Book of Ultima

by Shay Addams
Introduction by Lord British
$14.95 244 pages

Written with the assistance of Lord British, *Ultima*'s creator, this official guide includes inside information found nowhere else. Packed full of hints, tips, anecdotes, and never-before-published clues for all six *Ultima* adventures.

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by Richard Sheffield
Foreword by Sid Meier
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This is *the* official guide to MicroProse's best-selling F-15 simulators. Covers both *F-15 Strike Eagle* and *F-15 Strike Eagle II.* Filled with step-by-step instructions and clear diagrams.

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JUNE91CI

jects, the people involved in them, and project deadlines and milestones. With this module, you set up projects and milestones and develop a calendar to manage a project. Alternatively, *who-what-when* can display a Gantt overview of a project in a time-line format.

The *when* portion of the program displays a personal calendar for appointments, tasks, and deadlines. Also available are daily and weekly office calendars.

A fourth facet of the program is its *etc.* module, used for general reference, printing, and housekeeping. Enter the names of the people you want to attend a meeting, find the free time for each person, and coordinate a meeting around each person's schedule. Generate reports to set priorities, schedule project commitments, or develop mailing lists.

Hard disk installation of the program involves no more than typing INSTALL and designating the default drive in which you'd like the application and its data to be placed. You'll need 1.5 megabytes of free hard disk space free, though.

Help is available by pressing the F1 key for simple instructions and background regarding a particular *who-what-when* application. What is lacking, however, is a panic key that will step a user through a difficult situation.

A nice feature of *who-what-when* is its ability to use a hot key to switch to a user's favorite applications—communications, word processor, or spreadsheet—while staying in the program.

When you install *who-what-when*, it gives you the option to hot key in and out of *who-what-when* and other software. For example, you can use the default memo module for short notes, or you can choose to access your favorite word-processing program instead. The same can be done with the program's default autodial hot key and your communications software, and the calculator hot key and your spreadsheet. If you have no favorite alternative utility application, the *who-what-when* hot keys can be set up to access other software.

Chronos will release a network version later this year, called *who-what-when Enterprise*, which will link PC nodes on a network together to coordinate personal and office calendars, project schedules, project milestones, card files, telephone lists, memos, and messages.

Focused on maximizing human resources, *who-what-when* is first class for small work groups.

PETER FRANCIS

who-what-when
IBM PC and compatibles, 640K RAM, hard drive with 1.5 meg free—$295
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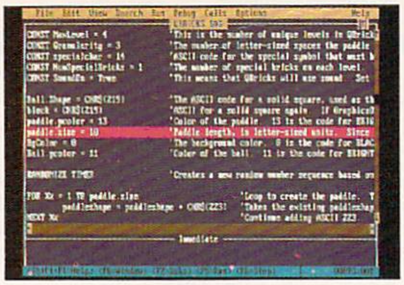
LEARNING CHOICE

MICROSOFT GAME SHOP

Experience the challenge and the fun of learning BASIC by playing and modifying games. Programmers from the early days of computing did. Now you can, too—though with much greater ease—thanks to *Microsoft Game Shop.*



Have fun learning BASIC as you modify game code in *Microsoft Game Shop.*

In the early 1980s, learning to program in BASIC was a necessary part of owning a personal computer. The scarcity of commercial software drove computer owners to learn programming—the best way at the time to get their marvelous machines to perform amazing tricks and play engaging games.

Computer magazines of the day offered plenty of type-in programs and BASIC programming tutorials, which readers eagerly studied, tested, and modified.

Within a few months, these early hackers (this was back when the term *hacker* was a badge of honor) were hooked. They practiced BASIC until it became second nature and then turned their attention to the faster, more powerful languages. The challenges of programming—logical thinking, problem solving, and creativity—turned many lives in new directions. Youngsters shelved dreams of becoming firemen or cowboys and pursued livelihoods as programmers. Older hands used programming abilities to energize aimless careers.

With the maturation of the personal computer industry, we now have commercial software available for almost any use. Magazines no longer devote countless pages to programming instruction, and user group members spend less time discussing loops and arrays.

These changes have made the personal computer more a tool for work and less a tool for creative recreation. With its combination of crossword puzzle, Rubik's Cube, action game, and adventure game, *Microsoft Game Shop* provides an opportunity to return to the good old days of computing. It's recreational, educational, and challenging.

Microsoft Game Shop includes a full-featured version of Microsoft's *QuickBASIC* interpreter plus six classic computer games, including a version of *Tetris* that you can both play and modify using *QuickBASIC.*

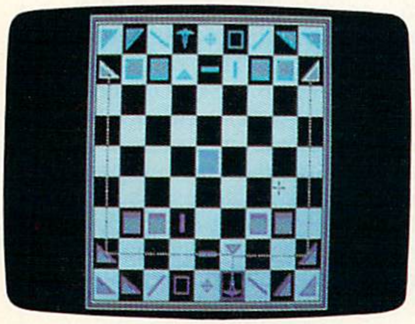
Learning wouldn't be fun without adequate help, and this package gives you plenty. Support includes *QBI Advisor,* an electronic BASIC programming reference guide, and *QuickBASIC Express,* an online introduction to using the *QuickBASIC* interpreter. The package also includes *Learn BASIC Now,* a 490-page text that provides step-by-step programming instruction plus dozens of sample programs—all carefully dissected and explained.

QuickBASIC has its roots in

Super Publisher's Closeout Sale

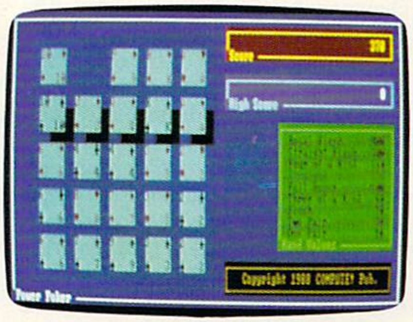
COMPUTE's BEST PC GAMES

Don't miss these six dazzling, ready-to-run games complete with a 16-page magazine jammed with instructions!



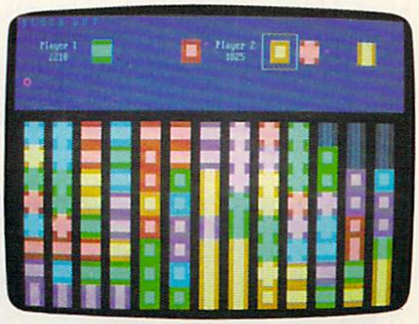
Laser Chess

Award-winning, two-player strategy game patterned after chess—but with an exciting new twist.


Score 370
High Score 0
Copyright 1988 COMPUTE! Pub.
Power Poker

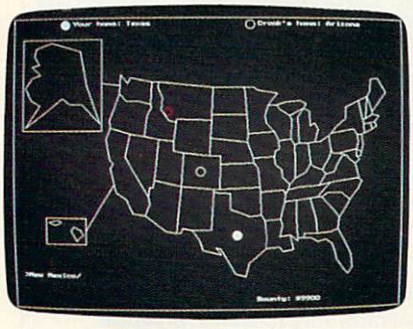
Power Poker

Addictive strategy game with a new dimension. Fun for one player or a group.


Player 1 2210
Player 2 1025

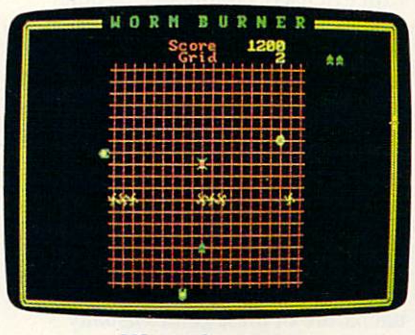
Block Out

Colorful and delightful strategy game that everyone in the family will want to play.


Your home: Texas
Crook's home: Arizona
Bounty: 99900

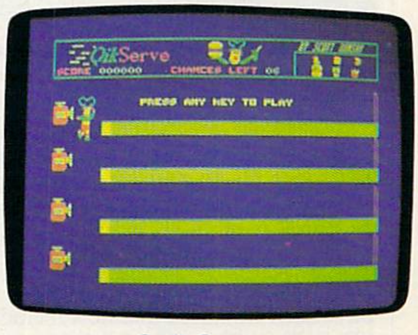
Bounty Hunter

Catch the crook and collect the bounty! So much fun, you'll never know you're mastering U.S. geography.


WORM BURNER
Score 1200
Grid 2

Wormburner

Skill and arcade action combine to form an unbeatable challenge.


QuikServe
SCORE 000000 CHANCES LEFT 06
PRESS ANY KEY TO PLAY

QuikServe

Fling those fries! Sling those shakes! Bounce those burgers! A frenzied arcade-style game for the stout-hearted only.

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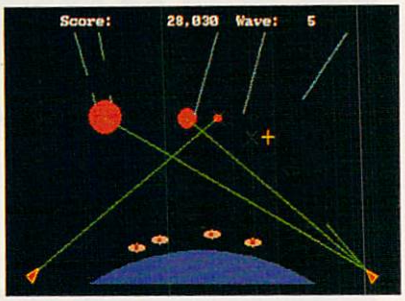
BASICA and GW-BASIC, but it's been enhanced, extended, and upgraded to keep up with the times. *QuickBASIC* provides instant syntax checking as you write your programs and also includes diagnostic error messages.

When programming in *QuickBASIC*, you'll work in a windowed environment with pull-down menus, mouse support, and a hypertext online reference manual. When editing, you can cut, copy, and paste; you also have access to full search-and-replace capabilities.



In *QSpace*, defend your space stations from a ferocious enemy missile attack.

The language itself makes many improvements on the older versions of BASIC. Under *QuickBASIC*, line numbers are optional; IF/THEN/ELSE/END IF blocks, SUBprogram blocks, and FUNCTION blocks are permitted; flow-control structures have been enhanced and now include SELECT CASE and LOOP WHILE/-UNTIL provisions; long integers, fixed-length strings, and constants are supported; user-defined data types are permitted; and code and data capacity have been extended from 64K to 160K.

Microsoft Game Shop combines this advanced, friendly programming language with a half-dozen games to get budding programmers involved and interested. These games—*QBlocks, QSpace, QBricks, QSynth, QMaze,* and *QShips*—are essentially the same as those that budding programmers laboriously typed in from magazine listings years ago.

For the most part, these games are dated. Kids who've grown up on Nintendo and Turbo Grafx-16 no doubt will find them dull. But with *Microsoft Game Shop,* your fun and challenge are less in playing the games than in understanding how and why they work.

As you finish a session with one of the games, a screen offers suggestions for how you might change the game to make it more interesting or more challenging.

For example, the suggested options for modifying *QSpace* include changing the speed of the enemy missiles and targeting crosshairs, changing the sound effects or the colors of the pieces, changing the number of missiles, or altering the size and duration of explosions.

These most obvious changes are designed to whet your appetite. Once you begin tinkering with program code, you're learning to program. As your confidence builds, you'll want to make bigger changes, and before long, you'll dream up your own game scenarios and design your own programs from scratch.

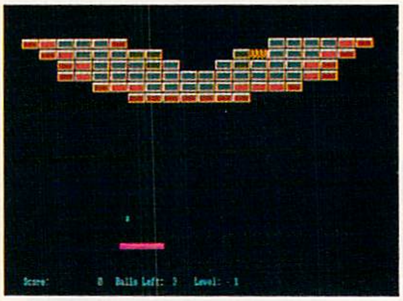
All of the game programs included with *Microsoft Game Shop* come with extensive comments. In other words, the purpose of nearly every line and its interaction with other lines in the program is fully explained. It's easy to learn how *QuickBASIC* works and how the programs work by studying the code.

Although neither exceptionally challenging nor state of the art in terms of graphics or sound, these simple games are an excellent milieu in which to learn programming. The visual nature of these games usually makes programming mistakes quite apparent and thus easily correctable. Games also give you ample opportunity to use most of the features and commands of the language. Once you understand how these games are put together, you'll have a sound basis for creating your own games and applications. You'll be an old hand with loops, counters, timers, functions, and subprograms.

Playing and modifying the games involve rather a seat-of-the-pants approach to learning programming. For a more structured step-by-step introduction to *QuickBASIC,* you'll study the *Learn BASIC Now* manual in conjunction with more than 130 program samples that come on the *QuickBASIC* disks.

In working through the manual, you'll be introduced to commands and concepts one by one. It's a building process that you can take at your own pace. *Learn BASIC Now* also serves as a reference manual when you need a quick reminder of how to use a certain BASIC statement.

No programmer is exempt from mistakes, and no program is ever written without bugs. Learning to debug programs is a big part of learning to write programs. The *Learn BASIC Now* manual includes a chapter dedicated to this task. This section includes tips on how to spot common programming errors—syntax errors, logic errors, and runtime errors—and how to use *QuickBASIC* commands to find and eliminate pesky bugs. *Microsoft Game Shop* even includes a few error-riddled program samples to provide some debugging experience.



In *QBricks*, you control a paddleball with some well-planned computerized twists.

You'll come to rely heavily on *QBI Advisor,* an outstanding online programming reference program. With the click of a mouse button or the press of a couple of keys, you'll access a wealth of information. *QBI Advisor* has information about how to use the program and its menus, as well as specific information about each of the keywords in the *QuickBASIC* language.

When you seek help on a BASIC keyword, you first see a screen with a quick explanation. At that point you can opt to view a more detailed explanation or to see an example of how the keyword would be used in a program. These help screens often refer you to similar or associated commands, and again, a click of the mouse or a press of a key will fetch information on those topics.

Another helpful feature of *QBI Advisor* is that it includes online tables of ASCII characters and keyboard scan codes.

Successful programming involves a significant amount of work with reference materials. The well-designed and detailed *QBI Advisor* will save you a lot of time and will help keep your desk from becoming a disaster area cluttered with books, charts, tables, and manuals.

As implied by the name, the *QuickBASIC* interpreter is an interpreted language. This means that as you run your programs, *QuickBASIC* reads each statement in the program, converts the statement to codes that your computer's CPU can understand, and then sends those codes along for processing. This is a time-consuming process, and its effect shows in programs involving significant number crunching or serious arcade action; you might be surprised at how slowly a computer can run.

If you're a beginning programmer, however, you'll find interpreted languages more than adequate and, in fact, beneficial in that they allow you to test programs quickly without having to compile them first.

If you end up being bitten by the programming bug, there's an easy upgrade path from *Game Shop*. Microsoft's *QuickBASIC* is a compiled language that can run any of the programs created with *Game Shop*.

When a program is compiled, all of its commands and statements are converted to machine code stored in a separate file. That new file, a standalone program, can run on any computer. It doesn't need *QuickBASIC* to work, and it will be executed up to ten times faster than the interpreted version.

Years ago, being computer literate meant learning to program in BASIC. Although there is less emphasis on programming today, programming remains a challenging, creative, and even entertaining enterprise; and computer users who understand programming will always be a step ahead of those who don't.

BASIC is an ideal first language. Its ease of use provides programmers with a simple way to learn and experiment with programming concepts that are the building blocks of programs written in any language.

For learning to program, *Microsoft Game Shop* provides an excellent introduction with plenty of fun and useful tools. First time programmers have a chance to experience the challenge and excitement of the old days of computing, but with all the comforts afforded by today's technology.

TONY ROBERTS

IBM PC and compatibles, 512K RAM, two 5¼-inch floppy drives or one 3½-inch floppy drive, CGA, EGA, or VGA; mouse optional—$49.95

Package includes four 5¼- or two 3½-inch disks; *Learn BASIC Now*, a 490-page manual/tutorial; a *Game Shop* getting-started flier; a discount offer on *Microsoft QuickBASIC;* an amendment to the Microsoft License Agreement; product registration; and warranty cards.

MICROSOFT
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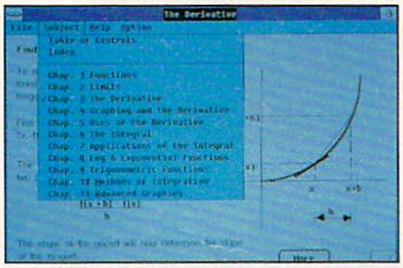
CALCULUS

Running *Calculus* reminds me how tough learning and then teaching calculus was and illustrates how much easier a program can make the process. You probably can't learn the subject by using software alone, but you approach enlightenment sooner by supplementing your study with this package. And if you're learning algebra, geometry, analytic geometry, or trigonometry, you'll benefit from many of the chapters.


The Derivative
File
Subject
Help
Option
Table of Contents
Index
Chap. 1 Functions
Chap. 2 Limits
Chap. 3 The Derivative
Chap. 4 Graphing and the Derivative
Chap. 5 Uses of the Derivative
Chap. 6 The Integral
Chap. 7 Applications of the Integral
Chap. 8 Log & Exponential Functions
Chap. 9 Trigonometric Functions
Chap. 10 Methods of Integration
Chap. 11 Advanced Graphing
x
x+h
h
More

Derivatives are made visual by *Calculus*.

Calculus runs in the *Windows* operating system. That means you need at least an AT class computer with a 286 processor and an EGA graphics card or better. Sure, those are stiff requirements, but one of the beauties of this program is that it takes advantage of the latest technology to effectively present information.

During my teaching career, I explained to my students that functions were like number-processing black boxes. The box was an equation that performed operations on numbers that are plugged in, and out comes the result. They all said, "Huh?"

Now you can actually see a function as a boxlike icon. The input numbers fall into the box, and out the bottom comes an answer. That's what I call an effective illustration of functions! All of the examples included are interactive. You can alter the function and experiment with different input numbers to see what comes out.

The prize for the hardest concept to teach goes to the graphing of lines and functions. Once again, this program does a tremendous job of showing how the math works and offers you the chance to dynamically interact. You can pick different equations and numbers, and you'll see how the various factors affect the graph.

The final hurdle on the road to understanding advanced mathematics is the derivative. It's tough to make sense of the old phrase *rate of change*, but when *Calculus* presents it, you can actually see a derivative and how it relates to a function. That's a lot better than graphing hundreds of functions and dozens of derivatives for each one before learning the concept.

Calculus comes with lots of extras that make learning even easier. There are online explanations of chapters if you need help; they consist of problems, tutorials, or a mixture of both. Optional sets of hints for the problems and positive reinforcement for right answers are also part of the package. The developers went the extra mile to make certain that this program was everything that an advanced mathematics program should be.

If you're looking for a terrific supplement to your children's math education, by all means buy this program. Anyone who uses *Calculus*—especially the mathematically timid—will be reaping the benefits for years to come.

RICHARD LEINECKER

IBM PC and compatibles, 640K RAM, EGA or higher video card, *Microsoft Windows* 2.1 or higher (runtime version supplied in package)—$99.95

Also available for the Macintosh—$99.95

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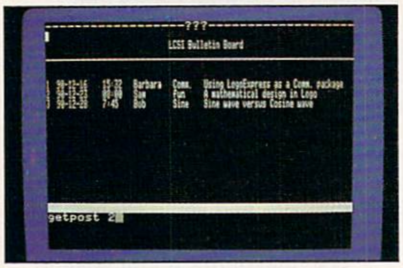

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2 90-12-23  08:00  Sam      Fun    A mathematical design in Logo
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PC STUDY BIBLE

What does the Bible mean when it says to love one another? There are several ways to decide. One way requires a stack of dictionaries, concordances, and cross references, along with hours of page flipping. The other way is to turn on your computer, load *PC Study Bible,* and go!

In many ways, *PC Study Bible* is a Bible student's dream come true. The basic package integrates three versions of the Bible (the King James Version, the American Standard Version, and the New International Version) with a multifaceted concordance, a notepad, a word processor, and *Nave's Topical Bible.* Optional add-ons include additional Bible versions plus a Greek-Hebrew dictionary. The result is a truly powerful study tool.

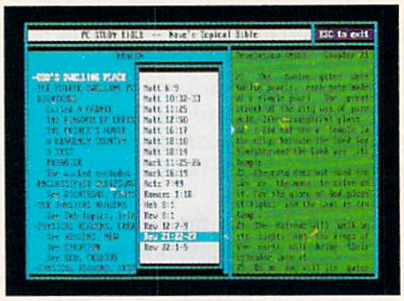
At the heart of the program is the Bible reference section. You can start at any book, chapter, and verse, and move to other references with ease. Multiple windows allow you to work with several translations at one time, and scrolling through one automatically scrolls through the others. And if you're simply reading, there's an automatic variable-speed scrolling feature.

PC Study Bible's concordance works with any of the program's Bible versions. You can search for words or phrases, and do and/or searches within verses. You can also locate words you don't know how to spell. Simply enter the first few letters followed by a plus sign, and a list of likely spellings pops onto the screen. If you're looking for proper names or places, however, you must capitalize the first letter. Otherwise, the screen will say *nothing found.*

As mentioned, *PC Study Bible* includes *Nave's Topical Bible,* which cross-references Bible topics in more than 100,000 verses under almost 20,000 different headings. It includes outlines on hundreds of subjects and is valuable for in-depth topical studies.

Biblesoft offers *Strong's Greek-Hebrew Dictionary* and *Englishman's Concordance* as an add-on option. It provides immediate insight into Hebrew and Greek words and gives you fingertip access to original definitions and derivations. You can even locate every place where a given Greek or Hebrew word appeared in original texts. A good concordance is tremendously powerful and, compared to the traditional page turning of a printed concordance, research with this electronic one is essentially effortless.

As you work with the program, chances are good that you'll want to record scriptural passages, word info, and your own comments. To make this easier, *PC Study Bible* includes a built-in notepad. The program also includes a word processor, although you may want to use your own word-processing package for final editing.



Every verse of the Bible is indexed and ready for reference in *PC Study Bible.*

PC Study Bible has features galore, but how does it work in practice? Very well. Installation is simply a matter of making a directory and copying disks, although there are lots of disks to copy. The user interface is straightforward, using a combination of function keys, pop-up menus, and single-key commands to call various functions. This is a package that won't take long to master, but it's one you'll be using for a long time to come.

STEVE HUDSON

IBM PC and compatibles, 320K RAM, two floppy drives or a hard drive. Basic package—$149.95, starter edition (King James or New International Version without *Nave's Topical Bible*)—$79.95

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MIXED-UP MOTHER GOOSE

Nothing brings classic literature to life like colorful illustrations. Combine these with the lessons of a nursery rhyme and events in a child's own life, and you have an unbeatable way to educate and entertain at the same time. *Mixed-Up Mother Goose,* an adventure game aimed at preschoolers, does just that. Combining inspired graphics and ease of play unlikely to frustrate even a four-year-old, it draws a child in and allows him or her to learn by playing a game. Type in a name, select a representative animated character, and almost immediately a child is winging into an extended adventure astride Mother Goose's goose.

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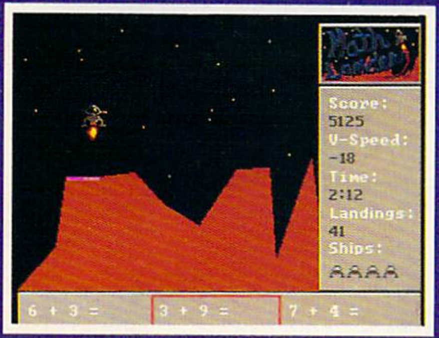
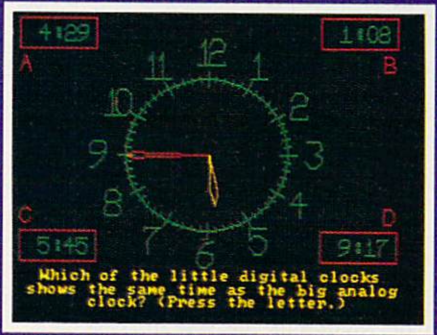


Score: 5125
V-Speed: -18
Time: 2:12
Landings: 41
Ships:

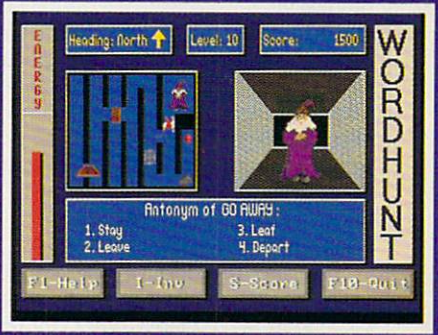
6 + 3 =
3 + 9 =
7 + 4 =

You're a goner if you miss the landing pad in *MathLander.*



Which of the little digital clocks shows the same time as the big analog clock? (Press the letter.)

Time will tell if you've learned your lesson in *TimeTeller.*



Heading: North ↑
Level: 10
Score: 1500

Antonym of GO AWAY:
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3. Leaf
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Watch your step! *WordHunt's* maze is full of hazards.

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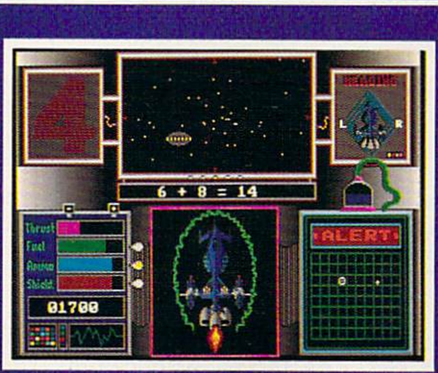

6 + 8 = 14

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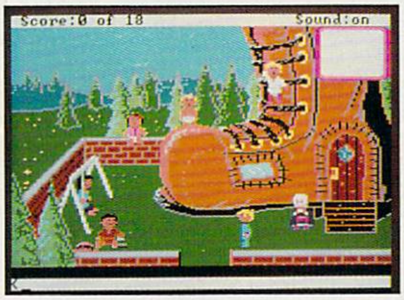
The yarn-spinning spinster herself greets the child outside her cottage, asking for help in straightening out her mixed-up rhymes. Mary can't seem to find her little lamb, and Jack and Jill need their pail before they can make an ill-fated uphill climb. Those and 16 other rhymes must be set right before the game can end. Just by going through this process, a child can't help but learn.

After the child's name has been typed, no further typing or complicated keystrokes are required. The character is maneuvered using a joystick, mouse, or arrow keys. An object is picked up simply by walking up to it; the nursery rhyme characters speak when approached. Doors open automatically.

Besides providing an elementary, engaging introduction to the personal computer, *Mixed-Up Mother Goose* teaches problem solving, object recognition, and even map reading as the child winds his or her way through fairy tale territory with the help of a colorful poster. Of course, there's also a boost to reading skills and an appreciation of rhyming and wordplay as the rhymes unfold. For children who have never read Mother Goose before, this game might well be an enticement to seek out the stories.



The old woman who lived in a shoe isn't the only nursery rhyme character you'll meet in *Mixed-Up Mother Goose.*

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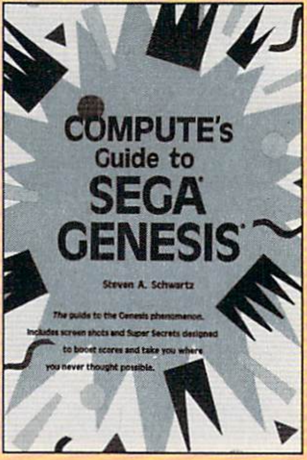
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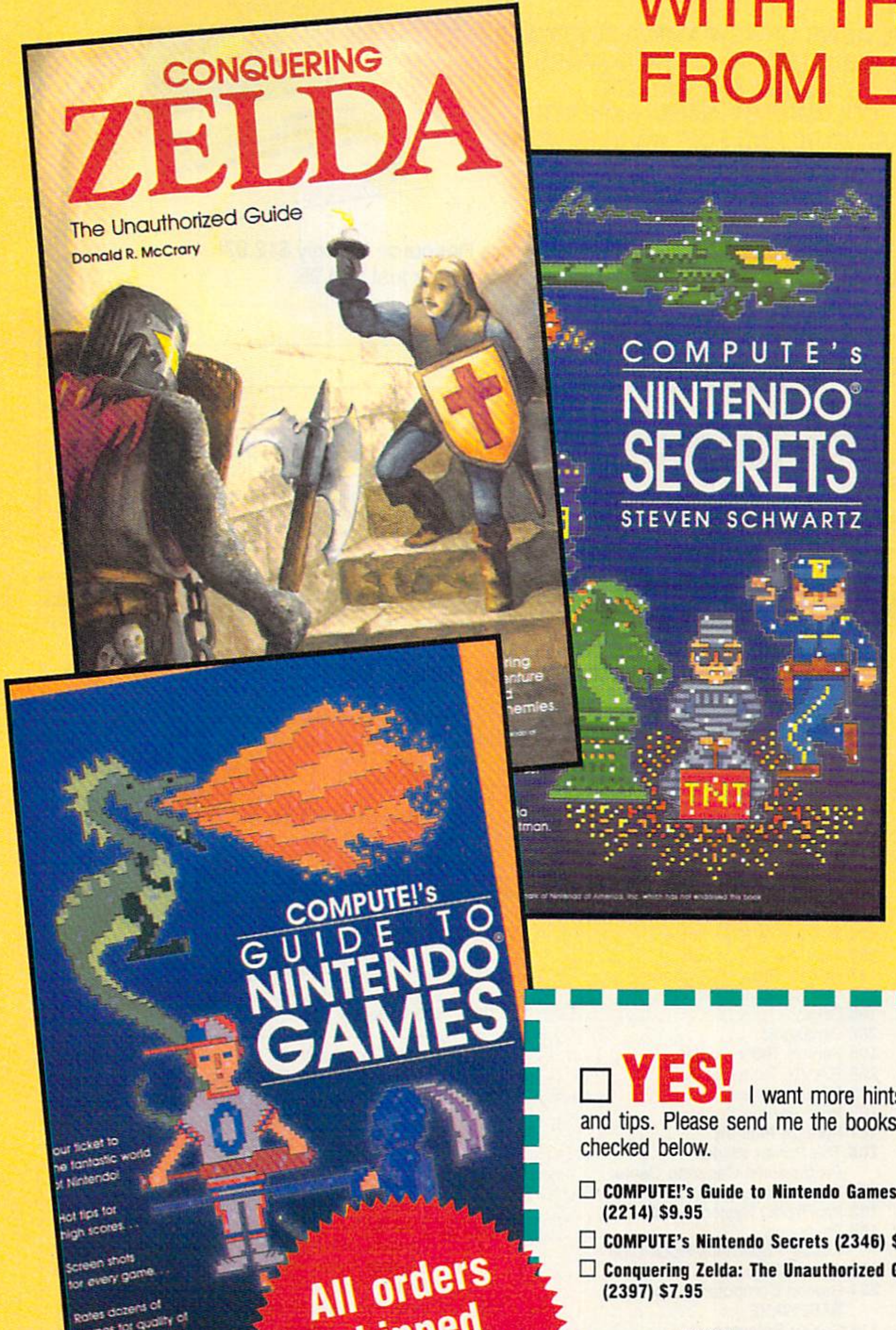
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Best of all, though, *Mixed-Up Mother Goose* is fun. The characters are vibrant and distinct, meandering through a colorful landscape strewn with pumpkin houses and castles, lost candlesticks and wandering fiddlers three. Lost objects usually appear relatively close to their owners, preventing frustratingly long travels. Simply changing scenes often unveils unexpected delights—whether it's the old woman's shoe or the crooked man's little crooked house.

The creators of *Mixed-Up Mother Goose* have pulled off an impressive feat: old-fashioned storytelling that holds its own in the age of Nintendo and Teenage Mutant Ninja Turtles. For educational value in a pleasing package, this is one wild goose chase worth completing.

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Reading and Me's interface is age appropriate. Children experienced in playing computer games will be able to master the interface quickly. Others will need someone to help get them started. All responses can be entered using a mouse or the keyboard. If you opt for the keyboard, you'll only use the arrow keys, space bar, and Esc key.

The four levels of drill are readiness, alphabet, phonics, and words. Each category offers three different games, varying the drills as well as allowing a child to progress as he or she masters each skill.

Although no computer program is going to teach children to read, *Reading and Me* offers some well-considered drill-and-practice exercises that build on the knowledge and experience the child already has. If you're looking for a simple, easy-to-use program for a preschooler or kindergartner, *Reading and Me* is worth considering.

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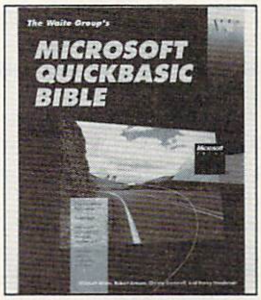
Here's another winning reference book from the Waite Group. A comprehensive (almost 1000-page) book covering *QuickBASIC* in detail, it's the manual that should have come with *QuickBASIC*. Though *Microsoft QuickBASIC Bible* tries to be all things to all people—tutorial, quick reference, and full reference—surprisingly, it works.



For programming in *QuickBASIC, The Waite Group's Microsoft QuickBASIC Bible* is required reading.

As the book moves from tutorial to general information to specific information, every inch is put to good use, including the inside covers (where quick reference indices appear in both alphabetical and categorical order). The coverage of compatibility between earlier versions of *QuickBASIC*, ANSI BASIC, interpreted BASIC, and *PowerBASIC* is good. Sample programs (available on disk for a reasonable $18.95) have good comments and usually manage to be somewhat useful. They also tend to avoid duplicating the online help and

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even refer you to sample programs included with the product, a refreshing change from books that rehash the manual and sometimes even duplicate sample files.

Two interesting appendices list files available on CompuServe to aid the BASIC programmer. Appendix A describes, by category, scores of articles available to users of Microsoft's Knowledgebase, used internally by Microsoft's product support team and available on CompuServe as well. Appendix B contains similar descriptions of program files on CompuServe. My only complaint is that the latter doesn't give credit to its authors, nor does it list the distribution terms of each program (public domain, shareware, freeware, and so on). Of course, this list will be out of date in a few years, but I still think it's an excellent idea. There's a lot of good code out there.

TOM CAMPBELL

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Like a tour guide, Mary Campbell escorts her readers on a well-documented expedition through the layers of *Lotus 1-2-3's* convoluted internal architecture. In her newest reference manual, *1-2-3 Release 3.1: The Complete Reference,* she tirelessly explores and explains all of release 3.1's myriad features.

Beginning with the basics, Campbell explains *1-2-3's* basic elements, such as the work sheet's components, menu terminology, and control key sequences. She subsequently details data entry, manipulating the work sheet's appearance, and printing. In later chapters she describes *1-2-3's* more advanced functions, such as

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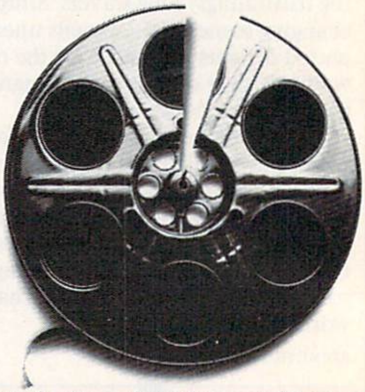

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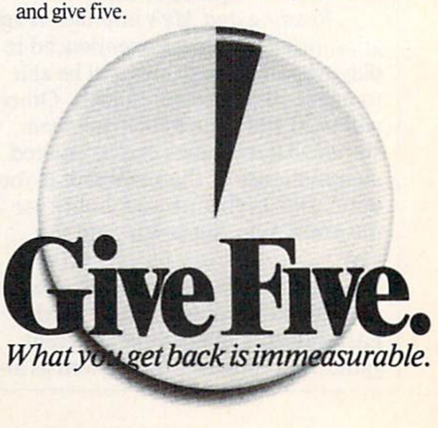

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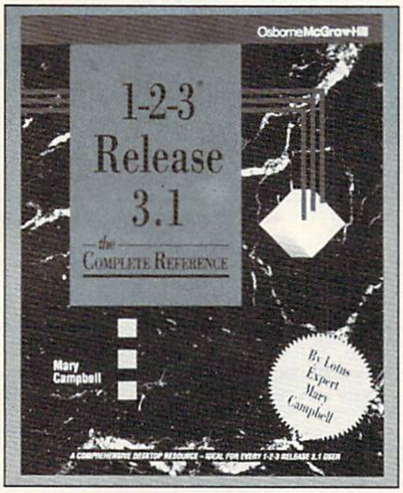
macros, database management, and graphics. The last chapter deals exclusively with 3.1's raison d'être: WYSIWYG. Throughout, Campbell's competent explanations are keyed to illustrations, and she provides numerous (and welcome) step-by-step examples.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the Complete Reference
Mary Campbell
By Lotus Expert Mary Campbell
A comprehensive desktop resource — ideal for every 1-2-3 release 3.1 user

For both spreadsheet amateurs and pros, *1-2-3 Release 3.1: The Complete Reference* has the answers.

In this release Lotus unleashes five new features: a WYSIWYG display, an additional (graphic) menu system, *Windows* 3.0 compatibility, multiple work sheets in memory, and 13 additional @ functions (prerecorded formulas). Although experienced users of earlier versions of *1-2-3* might consider Campbell's style overly detailed, the incremental challenge of manipulating these intimidating new features warrants her detailed analysis.

The 3.1 version weighs in as the most capable and complicated DOS spreadsheet published by Lotus. Accordingly, two types of users will appreciate this definitive reference—novices who want to walk before they run and spreadsheet-using specialists who need to uncover all of *1-2-3's* deepest secrets.

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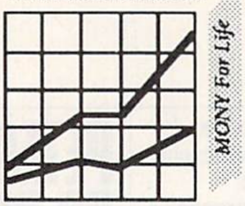

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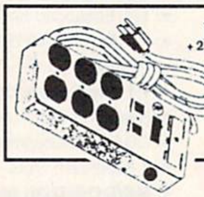

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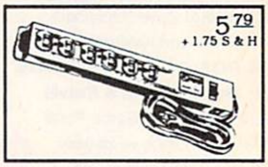

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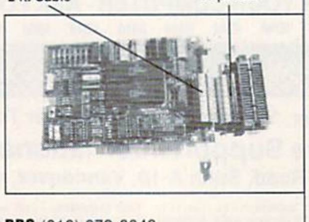

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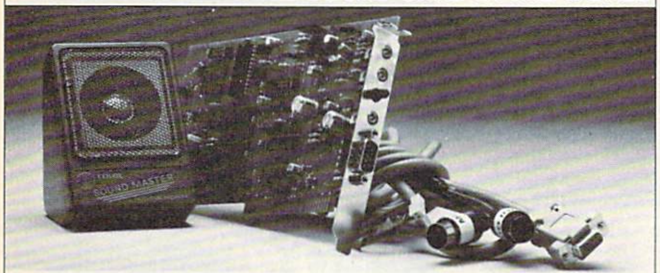

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FAST FACTS

GAME WINNERS

This past March in San Jose, California, the Computer Game Developers' Conference nominated several computer games as worthy of special notice. Conference attendees having cast their ballots, the following winners emerged.

Best Gameplay

The Secret of Monkey Island
LucasFilm Games
(415) 721-3300

Best Technical Achievement in a Computer Game

Wing Commander
Origin Systems
(512) 328-0282

Best Interface Design in a Computer Game

Loom
LucasFilm Games
(415) 721-3300

Most Socially Responsible Computer Game

SimEarth
Maxis (distributed by Brøderbund)
(415) 492-2101

Best Visual Presentation in a Computer Game

Wing Commander
Origin Systems
(512) 328-0282

Best Audio Presentation in a Computer Game

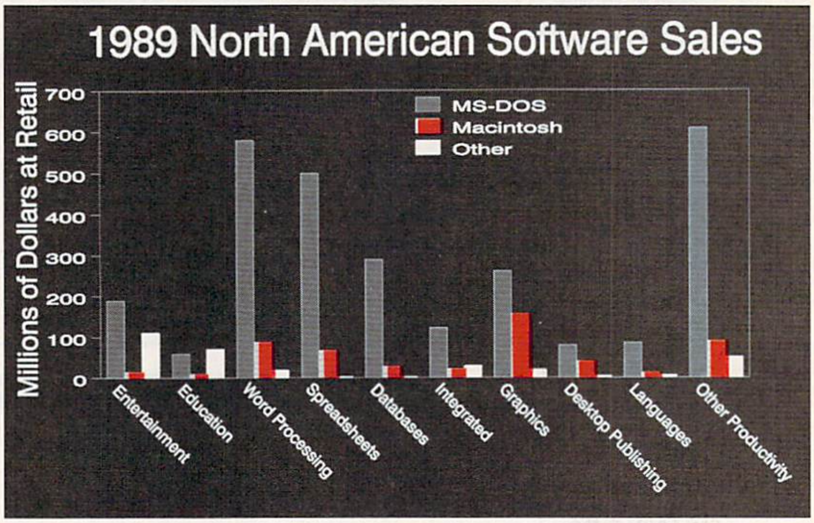
Wing Commander
Origin Systems
(512) 328-0282

Most Innovative Game

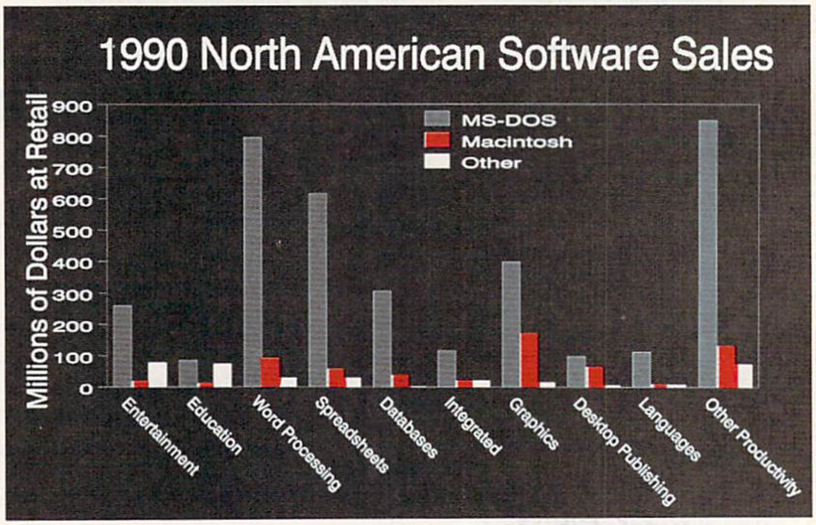
SimCity
Maxis (distributed by Brøderbund)
(415) 492-2101

Best Producer

Greg Hammond
LucasFilm Games
(415) 721-3300



Source: Software Publishers Association



Source: Software Publishers Association

Based on information submitted from 150 of the country's leading software publishers, the Software Publishers Association (SPA) announced that retail personal computer software sales increased 22 percent in the fourth quarter of 1990, compared with the same period one year earlier. MS-DOS sales increased 18.1 percent, and Macintosh sales were up 12.5 percent. Sales of *Windows* applications increased 198 percent. Education software sales for MS-DOS computers increased by one-third, while MS-DOS entertainment packages posted a 30-percent gain. Word processing remained the biggest software category. ⊡

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B. Is this your first computer? ☐ Yes 7 ☐ No 8

C. How long have you owned your computer? ______ 9 Years ______ 10 Months

D. Do you use your computer mostly for ☐ playing games 11 ☐ working at home 12 ☐ working at office outside home 13 ☐ school work/learning? 14

E. Do you find COMPUTE's new format helpful in finding information you need? ☐ Yes 15 ☐ No 16

F. What other computer magazine do you read? ☐ PC/Computing 17 ☐ Home Office Computing 18 ☐ Computer Shopper 19 ☐ PC Sources 20 ☐ PC Magazine 21 ☐ PC World 22

G. What is your total household income? ☐ >$30,000 23 ☐ >$40,000 24 ☐ >$50,000 25 ☐ >$75,000 26

H. What is your age? ______ 27 Years

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J. Do you advise other people on computer purchases? ☐ Yes 32 ☐ No 33

K. Comments: ______________________________ 34

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Name ______________________________

Address ______________________________

City ____________ State/Province ____________ Zip ________

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A. What kind of computer(s) do you own? ☐ IBM PC or compatible 1 ☐ Tandy 2 ☐ Amiga 3 ☐ Macintosh 4 ☐ Apple II 5 ☐ Commodore 64/128 6

B. Is this your first computer? ☐ Yes 7 ☐ No 8

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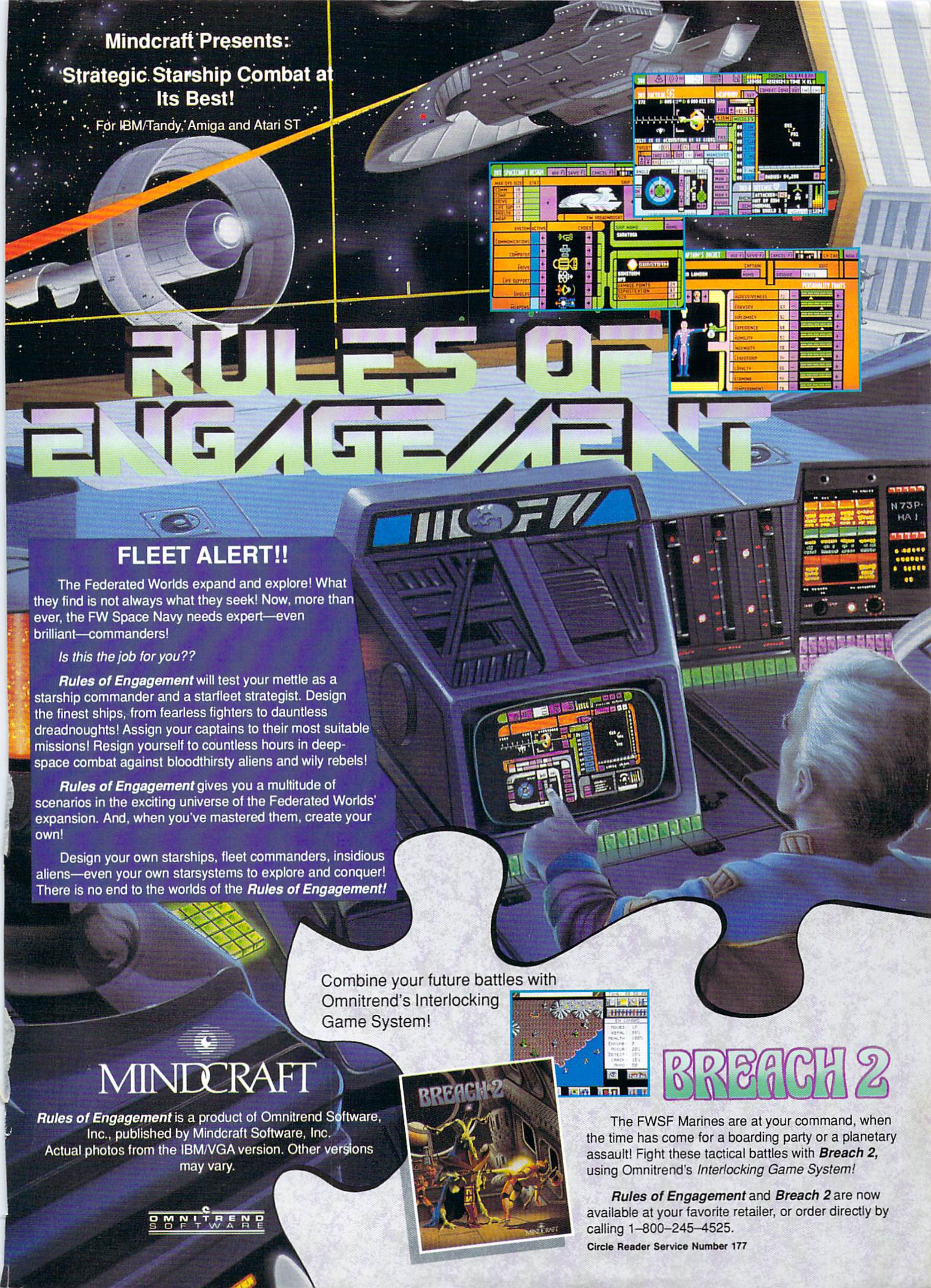

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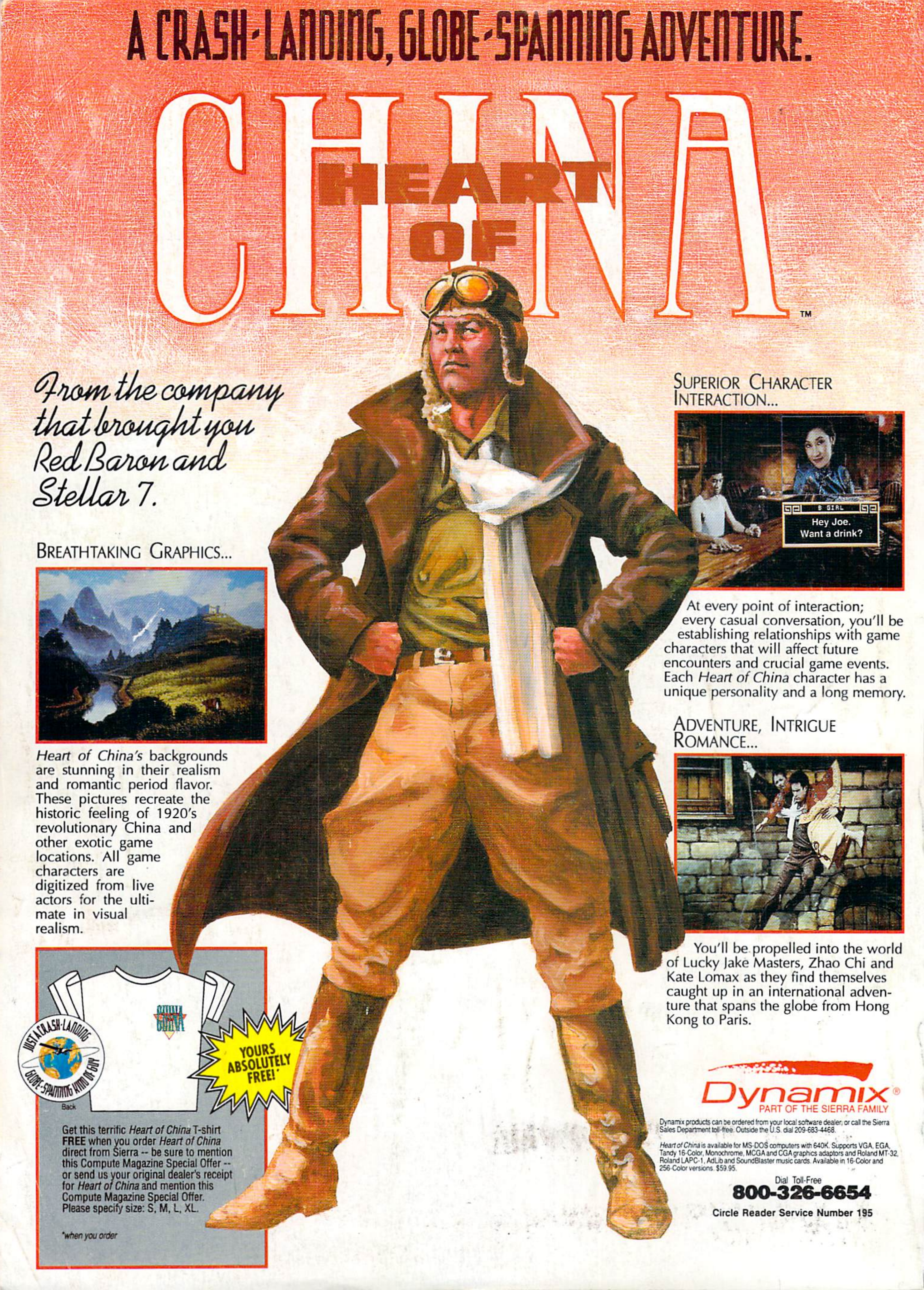
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